

Vol. 11

TAMPA, FLORIDA, SEPTEMBER, 1930

No. 9

Soil Acidity And Its Relation To Growth of Citrus

By B. R. Fudge, Assistant Chemist, Citrus Experiment Station, At Farmer's Week

The subject of soil acidity and its relationship to citrus fruit production is a very interesting one, and one in which all of the growers with whom I have had contact are interested.

Sandy soils like those we have along the ridge section of the State are potentially acid, and being under humid climatic conditions they yield a rather high active acidity or hydrogen-ion concentration due principally to the leaching of the basic substances. In other words, our virgin sand soils are quite acid.

The origin and effect of acid soil conditions are quite difficult to determine due principally to the fact that the soil is composed of mixtures which are exceedingly variable and complex. It has been found on certain acid soils that applications of lime sometimes increased crops. Thus it was reasoned that soil acidity was injurious to all crops and that sufficient lime should be added to completely neutralize this acidity. This, however, was soon found to be untrue because plants vary in the degree of acidity at which they make optimum growth. It is now generally conceded that a great many plants grow best in a neutral or slightly acid medium. There are some plants which require a very acid medium.

Investigators in the subject of soil acidity and its relation to plant growth have come to recognize or have classified soil acidity into three

groups as regards its origin and kind; namely, mineral acids, organic acids and free H-ions. Thus, the active acidity, or hydrogen-ion concentration, the exchange acidity or mineral acids, and the hydrolytic acidity, or organic acids which are usually obtained by subtracting the exchange acidity from the total acidity, and which is considered to arise principally from hydrolysis of organic materials. Only the active acidity or free H-ion concentration has been considered in this paper.

Under acid soil conditions in light sandy soils there is a tendency to form active acid reacting compounds of aluminum, iron, and manganese which unquestionably arises from the exchange acidity or the active acidity, or both. The soluble compounds of these metals may enter the plant in toxic concentrations under the acid conditions unless they are leached or some substance is present to remove them from solution.

I should like to present at this time some results which we have obtained with the quinhydrone electrode in potentiometric determinations of the active acidity or the hydrogen-ion concentration of soil solutions from groves along the ridge section. All soil samples were taken with a soil sampling tube. Samples were taken from the top foot and the fourth foot, immediately beneath the first sample. Thus, in the tables, the figures in the column headed "pH

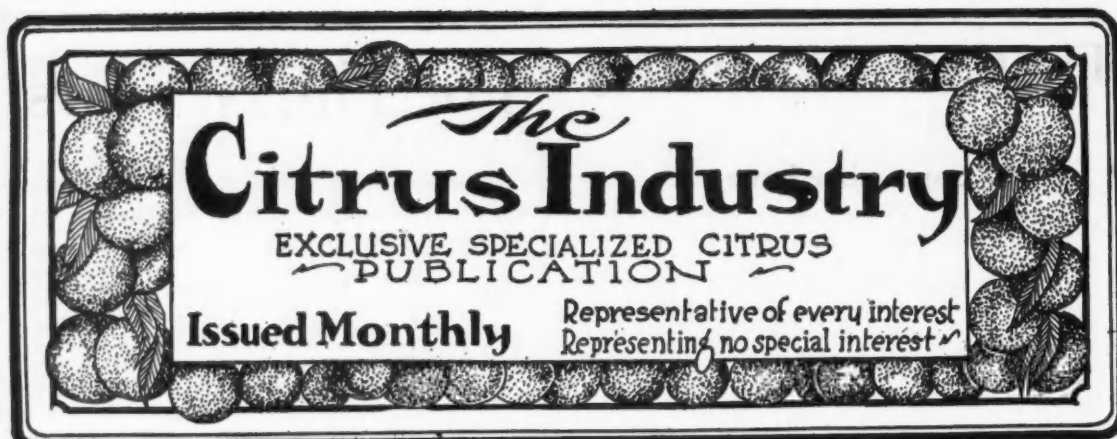
—A" refer to the reaction of the surface foot of soil and those in the column headed "pH—B" refer to the reaction of the fourth foot of soil.

Since there may be some of you here who do not understand what is meant by H-ion concentration as commonly expressed in pH, I shall briefly explain it. The term pH is merely a symbol which was suggested and accepted for use in hydrogen-ion work. It obviates the use of unwieldy mathematical terms in the expression of the hydrogen-ion concentration. All we need remember is that a pH value of 7.00 indicates a neutral soil or one neither acid or alkaline. All values above 7.00 indicate acid soils. The lower the figure the more acid the soil.

Grove I

Although I am presenting the entire pH value as obtained in the determinations, the figures beyond the first place to the right of the decimal have little significance in soil work.

Number 1 is a grove of pineapple oranges located near Frostproof. The trees are about ten years old and have a very heavy crop of fruit this year. The foliage is normal in every respect. The grove has received complete fertilizer mixture and has never received an application of lime. The soil, I think, is a little better than the average sandy soil and bears a heavy cover crop of maiden cane. The data shows that this grove is quite acid. There is no yellowing or



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chlorotic condition of the foliage.

No.	pH-A	pH-B	Remarks
1	4.864	4.405	Excellent citrus
2	4.779	4.337	" "
3	4.898	4.558	" "
4	4.798	4.541	" "

Grove No. 2

Number 2 was limed ten years ago, and altho the reaction is on the acid side of neutrality, the trees show quite distinctly that they are still suffering from the application of lime which was quite heavy. The foliage was quite yellow and the trees contained a great amount of dead wood. This grove is being treated with sulphur compounds in an attempt to increase the hydrogen-ion concentration. Although the reaction is down the trees are not responding very rapidly.

No.	pH-A	pH-B	Remarks
1	5.806	4.524	Condition fair
2	5.432	4.320	Poor Citrus
3	5.323	4.490	Poor Citrus
4	6.265	4.694	Very poor Citrus
5	5.265	5.000	Had Citrus

Grove No. 3

This grove is about 18 years old and is an interesting experiment. One half of the grove received a treatment of colloidal phosphate and the other half received a treatment of lime. The experiment was started about one year previous to the time of sampling. The averages show that the lime has been much more active in bringing the pH toward neutrality. However, they are both still quite acid. Slight yellowing in the foliage of trees on limed plots.

Number	pH-A	pH-B
1	5.330	4.575
2	5.102	4.320
3	4.915	4.405
4	5.704	4.422
5	6.775	4.524
6	5.619	4.830
7	5.670	4.728
8	5.500	4.762

Grove No. 4

This grove is the most interesting one to me because it gives a reaction which is the nearest approach to neutrality and alkalinity that I have been able to find in the sand ridge soils. Also the citrus trees in this grove are in the poorest condition of any that I have yet found. The leaves are yellow and there is practically no fruit on the trees. Two or three prunings are required each year to keep the dead wood cut out. Even the fourth foot sample shows the effects of the liming.

No.	pH-A	pH-B	Remarks
1	6.605	5.670	Poor Citrus, Limed 10 years ago
2	6.741	6.231	Fair Citrus
3	6.792	6.486	Poor Citrus

Grove No. 5

This grove is in the vicinity of Lake Alfred and is in what I consider a good condition. The grove is 18 to 20 years old and has borne the owner many good crops. The average

THE CITRUS INDUSTRY

pH is about 4.7 for the surface soil and 4.4 for the subsoil—quite acid. However, there is no indication that the trees are being injured by the acid condition of the soil.

No.	pH-A	pH-B	Remarks
1	4.677	4.371	Good Citrus
2	4.949	4.388	" "
3	4.847	4.405	" "
4	4.745	4.490	" "
5	4.694	4.337	" "
6	4.660	4.626	" "
7	4.541	4.235	" "
8	4.966	4.405	" "
9	4.575	4.354	" "
10	4.881	4.320	" "
11	4.607	4.643	" "
12	4.449	4.405	" "
13	4.779	4.626	" "

Grove No. 6

No. 6 is another Lake Alfred Grove which shows an interesting thing in that samples 5, 6, and 7 are much higher than the others. The sampling was taken at definite intervals (every other tree) as we went through the grove. The trees in the vicinity of sample No. 6 were sick, having considerable dead wood and yellow leaves.

No.	pH-A	pH-B	Remarks
1	4.575	4.371	Good Citrus
2	4.490	4.201	" "
3	4.524	4.405	" "
4	5.284	4.434	" "
5	5.398	4.490	Poor Citrus
6	6.095	4.660	" "
7	5.449	4.592	" "
8	4.541	4.507	Good Citrus
9	4.694	4.422	" "
10	4.541	4.558	" "

Grove No. 7

This Grove No. 7 is also near Lake Alfred. A total of 88 samples were taken from this grove which is located on a hill. Samples were taken

Remarks	Colloidal Phosphate treated
Good Citrus	" "
" "	" "
" "	" "
" "	" "
" "	" "
Fair Citrus	Lime Treated
Good Citrus	" "
" "	" "
" "	" "

at about 60 feet intervals as we went across the grove in a north and south direction. Numbers 1—15 give the results obtained from the northern slope. Numbers 16 to 30 give the results from the top of the hill and numbers 31 to 44, the southern slope. The last three numbers 42, 43 and 44 were taken from a sand soak spot and indicate that the subsoil was less acid than the top soil.

No.	pH-A	pH-B	Remarks
1	5.330	4.864	Good Citrus
2	5.568	4.762	" "
3	4.982	5.221	" "
4	5.136	4.745	" "
5	5.255	4.864	" "
6	5.221	4.745	" "
7	5.017	4.575	" "
8	5.085	4.711	" "
9	4.915	4.541	" "
10	5.287	4.626	" "
11	5.255	4.541	" "
12	5.068	4.660	" "
13	5.238	4.660	" "
14	5.085	4.575	" "
15	5.031	4.626	" "
16	5.017	4.592	" "
17	5.000	4.458	" "
18	5.102	4.541	" "
19	5.119	4.660	" "
20	4.913	4.473	" "

21	4.898	4.711	" "
22	4.966	4.592	" "
23	4.711	4.558	" "
24	4.949	4.711	" "
25	4.966	4.524	" "
26	4.524	4.643	" "
27	4.711	4.980	" "
28	4.762	4.830	" "
29	4.983	4.762	" "
30	4.558	4.660	" "
31	4.966	4.660	" "
32	4.949	5.034	" "
33	4.864	4.711	" "
34	5.085	4.643	" "
35	5.102	4.830	" "
36	4.847	4.660	" "
37	4.456	4.711	" "
38	4.660	4.575	" "
39	4.677	4.371	" "
40	5.068	7.081	" "
41	5.745	4.405	" "
42	4.660	5.170	" "
43	4.337	4.983	" "
44	4.677	5.017	" "

Grove No. 8

This Grove, No. 8, is located in the vicinity of Fort Meade. It has had applications of lime and basic slag. The lime was not in a finely divided state. The lime was applied at the rate of 100 to 200 pounds per acre. Sample numbers 1 and 25 are the only ones which did not receive either basic slag or lime. Sample No. 5 received only basic slag. I was in this grove about a week ago. All of the trees have a good crop of fruit. The trees are looking good with the exception of considerable yellowing of the leaves. The water table is quite high—the fourth foot being wet in practically every case. It is doubtful that lime caused the leaves to turn yellow in this grove.

Number	pH-A	pH-B
1	4.745	5.102
2	5.680	5.105
3	5.857	5.381
4	4.558	4.643
5	5.272	4.762
6	5.051	4.473
7	4.983	5.170
8	6.850	4.932
9	5.500	4.932
10	4.660	4.609
11	5.170	4.660
12	5.017	4.966
13	5.381	4.932
14	5.347	" "
15	4.949	4.745
16	5.432	4.813
17	5.000	5.313
18	5.289	4.711
19	5.500	4.898
20	5.204	4.694
21	4.524	4.422
22	5.238	4.881
23	5.330	4.898
24	5.272	4.694
25	4.014	4.745

Grove No. 9

This grove, No. 9, is located in the vicinity of Plant City. The soil is typical of that section, low, dark, and has a sandy subsoil. The water table is well up in the fourth foot from the surface and sometimes within the third foot area, especially the low spots which show excessive yellowing and shedding of the leaves. The subsoil sample gives a higher H-ion concentration where the water table is high. The veins in the yellow leaves were split and had formed a dead corky growth over the lesion.

No.	pH-A	pH-B	Remarks
1	4.779	4.045	Leaves Yellow
2	4.949	4.150	" "
3	4.864	4.252	" "

(Continued on next page)

SOIL ACIDITY AND ITS RELATION TO GROWTH OF CITRUS

(Continued from preceding page)

4	4.779	4.558	Leaves Green
5	4.898	4.864	" "
6	4.983	4.932	" "

Grove No. 10

This grove is quite near No. 9. However, the results are not congruent with those of Grove No. 9 insofar as the acidity of the subsoil is concerned. The greatest difference is in the surface soils of Grove No. 10. However, the yellow condition of the foliage in both groves can be associated with low areas which have a high water table. Sample No. 9 was taken from a very old seedling grove which appeared to be in fine condition.

No.	pH-A	pH-B	Remarks
1	4.575	4.507	Leaves Yellow
2	4.592	4.439	" "
3	4.541	4.320	" "
4	4.558	4.218	" "
5	4.966	4.558	" "
6	4.405	4.677	" "
7	4.745	4.150	Leaves Green
8	4.830	4.837	" "
9	5.830	4.847	" "

Grove No. 11

Grove No. 11 is the source of nitrogen grove at the Citrus Experiment Station, with a few samples from the experiment called Potash No. 2. The data of the first table show that Nitrate of Soda tends to give the soil a reaction which, although acid, is well within the acid tolerance range. The Sulfate of Ammonia and blood plots (3, 4, 5, and 6) are quite acid—the grapefruit being extremely acid. However, no toxic or injurious effect of the acid condition can be observed in the trees of these plots. In the case of the mixture which is composed of Nitrate of Soda, Sulfate of Ammonia and blood, the reaction is slightly acid. The application of potassium and phosphorus are constants in these particular plots. The manure plot is not so very acid except for the subsoil in the grapefruit. Samples Nos. 11 to 14 are interesting because they give a comparison of incomplete mixtures. The most outstanding difference which these reflect is the fact that in every case the top soil is more acid than the subsoil. No. 12 illustrates very well the effect which phosphates have in buffering up the soil solution. I cannot account for the low reaction of No. 14, unless it is due to the presence of the sulfate ion of the potassium sulfate and the removal of the potassium.

No.	pH-A	pH-B	Remarks
1	5.250	4.320	Sodium Nitrate—Tangerine
2	5.068	4.499	Sodium Nitrate—Grapefruit
3	4.708	4.269	Amm. Sulfate—Tangerine
4	4.133	3.861	Amm. Sulfate—Grapefruit
5	4.601	4.320	Blood, Tangerine

6	4.082	4.405	Blood, Grapefruit
7	4.686	4.397	Mixture, Tangerine
8	4.320	4.363	Mixture, Grapefruit
9	4.551	4.669	Manure, Tangerine
10	4.601	4.295	Manure, Grapefruit
11	4.320	4.949	No fertilizer
12	4.711	5.255	Superphosphate
13	4.473	5.170	Sodium Nitrate & Blood
14	4.422	4.509	Potassium Sulfate & Superphosphate

Grove No. 12

This grove, No. 12, is an East Coast Grove located a few miles south of Melbourne. You can readily understand why I have no results for the fourth foot. The subsoil was too impervious and the water table too high. This is the only grove that I have tested which shows an average alkaline reaction. However, I understand that all of the groves in that section are alkaline. This soil is totally unlike those on the sand ridge, being naturally alkaline. The content of organic matter is much greater in this soil than in the ridge soils. The physical and chemical action of organic matter may explain the apparent discrepancy between groves on the East Coast and those on the ridge as regards the tolerance for the hydrogen-ion or the hydroxyl-ion.

Number	pH	Remarks
1	6.282	Good Citrus
2	7.098	" "
3	7.319	" "
4	7.683	" "
5	7.200	" "
6	7.523	" "
7	7.665	" "
8	5.500	" "
9	6.945	" "
10	7.285	" "
11	6.758	" "
12	7.472	" "

From the results that have just been presented it is quite evident that the groves which have received sufficient lime to bring the hydrogen-ion concentration to pH 6.0 and higher have been seriously injured; not merely by the lessening of the fruit production but also in a great many cases by causing the death of the trees. A reaction above pH 6.7 in sand soils where lime was used has caused the death of the trees. A point of interest in this connection is the fact that even after ten years time the ill effects of lime are still being observed.

On the other hand all of the groves, with one exception, (No. 8) which show the best vegetative growth as well as fruit production have never had any lime application. They have all received a complete fertilizer which has contained more or less nitrogen as sodium nitrate and sulfate of ammonia. In a majority of groves the inorganic nitrogen units have been about equally divided between these two sources of nitrogen. In the case of Grove No. 8 the application of lime and basic slag has not brought the H-ion concentration above pH 5.5 which may explain why no injury has been observed. How-

ever, in some of the limed groves that I have visited the injury due to lime, did not become apparent for about two years after its application. Not only have we found the best groves on sandy soils that have never been limed, but also, I have not been able to discover any injury due to the concentration of the H-ions even at a pH below 4. The ammonium sulfate plot of the nitrogen source grove illustrates this point. No doubt there is a toxic limit for the toleration of acidity, but it has not been found on any of the groves examined. This indicates that the citrus tree will tolerate a wide range of hydrogen-ion concentration. Altho this is true, it will be to the advantage of the life of the tree as well as to fruit production to keep the soil reaction at or near the optimum for tree growth and fruit production.

When we compare the soil reactions of East Coast groves with those of the Sand Ridge, we find that the optimum reactions are apparently different. One of the greatest differences between East Coast soils and sand ridge soils is the larger amount of organic matter in the former soils. This may explain the apparent discrepancy between optimum conditions for citrus culture in the two sections.

The residual effects of fertilizers upon the reaction of the soil are best shown in the nitrogen source grove (No. 11) because of the knowledge we have of the fertilizer applications for the past eight years. The residual effect of sodium nitrate has decreased the acidity slightly.

In the case of ammonium sulfate, dried blood and the mixture of sodium nitrate, ammonium sulfate and dried blood, the hydrogen-ion concentration has been slightly increased. The residual effects of fertilizers are evidently not very accumulative in the sand soils due principally to the conditions permitting of large amounts of leaching. The excessive leaching may explain why we have not observed toxic acid conditions in the sand soils.

The results show with few exceptions that the soil in the region of the fourth foot is more acid than the first foot, the difference being about pH 0.5. In soils having a high water table, the difference is not so great or so constant as in the high, well drained sand soils.

GOOD CROPS IN LEON

Corn prospects in Leon County look about 20 percent better than last year's yield, and the cotton crop is considerably better. G. C. Hodge, county agent, reports.

Some Results From Modified Cultivation In Citrus Groves

By M. B. Rounds, Farm Advisor, Los Angeles County, California

Among the several cultural operations incident to the production of citrus fruits, cultivation or stirring the soil is practiced probably as much as any other operation in the orchard. Prior to a few years ago, cultivation was considered an important operation for the purpose of conserving moisture and aerating the soil, as well as other functions. Probably the primary reason for cultivation was to form a mulch for conservation of moisture.

In recent years investigational work has been carried on for the purpose of determining the relationship of soil moisture to the tillage operation.

In California, Professors Veihmeyer and Hendrickson have carried on some very worthwhile studies and obtained some interesting and beneficial results from these studies. In brief, it has been demonstrated to their satisfaction that very little moisture is actually conserved for use of the plant by cultivating and making a mulch on the surface, and in most cases this conservation takes place only within the upper six inches of soil where in orchards no roots are functioning.

It was demonstrated that the drying out of the soil, especially from that portion where the roots are feeding, was caused by the absorption of moisture by the roots of either the trees or the weeds present in the orchard. It has also been demonstrated through a period of years, both in the laboratory and in the field, that soil which has been moistened up to its full field capacity will not move to dry soil for any distance at least any distance which would be of value to the growing plant or tree. Field capacity is the maximum amount of water any soil will hold after free water has drained downward. This movement of moisture through capillary action does not take place in any direction, either laterally, downward or upward. Because of these facts, working the soil does not cause the soil moisture to move in any direction.

Cultivation with reference to aeration is of no value in the opinion of many of those who have made the studies since aeration doesn't take place in the case of orchard cultivation of the surface soil except in that

portion which is actually cultivated and in which there are no feeding roots. We recognize, then, that there is no particular value of cultivating the soil for the purpose of bringing up water or holding water in the soil of an orchard or for greater aeration.

Cultivation is carried on in the orchard for the following purposes:

1. Eradication of weed growth, thereby preventing competition between the weeds and the tree for moisture and plant food.

2. Loosening the soil to make furrows or ridges in order to accelerate irrigation.

3. Turning under organic matter such as cover crops and organic fertilizers.

On a recent management tour through the east end of the county in the San Gabriel valley, several orchards were visited where reduced cultivation has been practiced for from two to five years. In all cases these orchards have been benefited by this practice. Trees have improved because the condition of the soil has been improved, permitting better aeration and deeper water penetration. The result of this practice has also been manifested in better root growth, utilizing a larger portion of the soil.

In the Raymond Carroll orchard in North Pomona, this practice has been carried on for about five years with very beneficial results. Plow sole has been reduced and almost eliminated and the soil is being used more efficiently by the tree in the development of roots.

The Johnson orchard, which is close to the Raymond Carroll orchard at North Pomona is one where the owner is very enthusiastic because of the results of this practice. He states that after two years his plow sole is very largely reduced and that water penetration is materially better.

At the W. A. Hays ranch, La Verne, because of reduced cultivation and the growing of cover crops throughout a large portion of the year, it has been possible to maintain a proper soil moisture condition throughout a greater depth of the soil than was possible prior to the beginning of the change of method two years ago.

Mr. Maehtlen, in his orchard east of Covina, commenced two years ago with the changed practice, namely cultivating only for the purpose of reducing weeds. The condition in his orchard was such that regardless of the amount of water applied, 16 to 18 inches was the maximum depth of penetration. Constant cultivation made the surface almost like ashes, with the resulting sterilization of the surface soil to the extent that cover crops would not grow satisfactorily during the winter. After two years of this practice, water penetrates with the same irrigation to about 56 inches and it is possible now to grow any kind of a weed or cover crop in the surface soil during the winter.

These are only a few orchards where a reduced cultivation program has been carried on during the last several years with beneficial results to the trees and the orchard.

Based on the results of laboratory and field investigations, and more especially on the results of citrus growers in their orchards during the past four to six years, we do not hesitate to advise the following program with reference to tillage or cultivation of the citrus orchard.

1. Cultivate primarily to control the weeds. This prevents competition between the weeds and the trees.

2. If necessary, in order to make furrows, cultivate.

3. Cultivate to turn under organic matter or cover crops.

The cultivation referred to in these statements means the stirring of the soil whether it is with a plow, disc, cultivator or a weeder. We advise also shallow cultivation, especially throughout the spring and early summer period.

Lastly, we would advise in connection with the tillage or cultivation operation to not cultivate until the soil is sufficiently dry.

SUB-TROPICAL EXPERIMENT STATION IN CHARGE WOLFE

Dr. H. S. Wolfe, graduate in plant physiology from the University of Chicago and a botanist of some note, began work at Homestead September 1 as Associate Horticulturist in charge of the Sub-Tropical Experiment Station, the State Board of Control has announced.

The New Idea In Citrus Fertilization

By R. W. Ruprecht, Chemist, Florida Experiment Station, Gainesville, Fla.

Since my talk at Farmers' Week a year ago, a good many mis-statements have been made in regard to my talk as well as regards statements I am supposed to have made at Lake Alfred. Some have condemned my remarks as not having been borne out by results, others that they did not go far enough, still others have twisted them around to suit their own purpose.

Before giving you our latest results with fertilizers, I want to briefly explain our position. As was mentioned a few minutes ago, some have criticised my remarks as not having gone far enough. Whether or not this is true will depend on your point of view. We feel that as research workers employed by the State, we should give the people the results of our experiments. In other words, we should give you the facts as we find them, rather than theories. We could tell you to do this or that because such a procedure had been found profitable in China, Japan, California and some other distant point. However, soil and climatic conditions are so different in these places that we have no assurance that the same procedure would have the same beneficial results with our soil and climate. Therefore, in my talks, I have confined my remarks to results obtained here in the State and only advised a change in the fertilizer practice after we have proved to our own satisfaction that you would get just as good or better results with the new materials or methods as you had been getting with the old. If we are in doubt about our findings, we frankly tell you so. We want you to feel at all times that you are safe in following our recommendations and for that reason we have been only giving you facts. Of course, we have our theories in regard to changes in the fertilizer practice, but until we have tried them and found them correct, we are not going to advise you to follow them.

Source of Nitrogen

As I said last year, our experience at Lake Alfred where we are comparing the inorganic sources of nitrogen, nitrate of soda and sulfate of ammonia, with the usual combination of organic and inorganic and the straight organic sources, dried blood, have shown that the inorganic ma-

terials are as good as the usual fertilizer containing both. The crops from the different plots have been as follows:

Average Yield Per Tree Per Year—in Pounds	Source of nitrogen	Apple or	G'fruit
Plot 1.	Nitrate of Soda	108	273
2.	Sulfate of Amm.	114	222
3.	Dried Blood	114	175
4.	Comb'n of 1,2,3	100	168
5.	Stable Manure	76	154

You can readily see that the source of nitrogen had little influence on the yield with the exception of the manure. With grapefruit there is a greater difference in yield than with oranges, the inorganic nitrogen sources giving a bigger yield than either the organic alone or the usual combination of organic and inorganic. The nitrate of soda block has given a somewhat larger yield than the sulfate of ammonia. The grapefruit yields represent only 4 years average while the oranges are the average of 8 crops.

The tree growth on the different plots has been much the same. No measurements were taken, but the smallest trees are on the manure plot while the next smallest are on the dried blood plot. The difference in growth between the inorganic sources and dried blood is not great.

Some criticism has been made in regard to the use of dried blood as the source of organic nitrogen. As dried blood is probably the most quickly available of the organic nitrogen sources, the claim that its use to represent this class of material is unfair is hardly justifiable. If anything, it is unfair to the inorganics.

The claim has also been made by some that the use of sulfate of ammonia will increase the acidity of the soil to such an extent as to ruin the citrus trees. That this is not true is shown by the determination of the acidity of the soil from the different plots. After eight years of continuous use of sulfate of ammonia, the acidity of the sulfate of ammonia plot is no greater than where the mixture of organic and inorganic nitrogen materials have been used. Nitrate of soda has decreased the acidity somewhat. If you wish to keep the soil reaction where it is, a combination of nitrate of soda and sulfate of ammonia can be used. The claim has also been made that the nitrate of soda block has had more die-back in it than any of the others. This was

true only one year, other years a little ammoniation was present in all of the plots.

We have not been making any special effort to grow a cover crop in this grove, not because we do not believe in cover crops, but because we did not wish to add any complicating factor to the experiment. The only cover crop we have grown has been natal grass. In actual practice, we would advise all of you to grow all the cover crops you can grow. If you get a good heavy growth of grass and weeds, there is no need for you to go to the expense of trying to raise a leguminous cover crop. But at the time you disc, or if you still plow your grove, then at the time you plow under the weeds and grass, add some nitrogen to feed the bacteria which cause the decay of the grass and weeds. Otherwise, these bacteria will take the available nitrogen in the soil and so rob the trees of the supply. Nitrogen is getting so cheap that we can afford to buy it rather than grow it. If, however, you have to plant a cover crop, you might just as well plant a legume as non-legume.

Concentrated Fertilizers

Perhaps next in importance to the source of nitrogen in our citrus fertilizer problem is that of more concentrated fertilizers. While we are conducting some experiments with the new concentrated fertilizers, these have not gone far or long enough to give us definite information. We have, however, been using what we may call high analysis fertilizers for some eight years. For instance, in place of a 4-8-4 fertilizer, we have been using an approximately 6-12-6 fertilizer for our spring application; a 4.5-12-7.5 in place of a 3-8-5 in the summer application, and a 4.5-12-12 in place of a 3-8-8 for our fall application. These have given uniformly good results as many of you who have visited the Lake Alfred Station may have seen. The fertilizers used in the source of nitrogen tests have been of this composition, due to the fact that we did not use a filler in making up the mixtures. We, therefore, feel entirely safe in recommending to you the use of somewhat more concentrated fertilizers than you have been accustomed to using. Such more concentrated mixtures should have a lower unit

cost, and as you will need less of them, there will be an additional saving in freight. There is no question in my mind that before many years you will all be using even more concentrated fertilizers than those mentioned, for the modern trend in fertilizer manufacture is towards more concentrated mixtures, especially so since the advent of the synthetic nitrogen compounds.

Just one word of caution in the use of the more concentrated fertilizers, be sure to distribute them uniformly. Do not drop a handful here and a handful there or you will be condemning them without just cause. They are not fool proof but when used intelligently, you will like them as well as the ones you are now using and will, we believe, get just as good results.

Another question that is being asked by many growers is,—"Can I put all my phosphoric acid and potash for the year on in one application?" We are sorry to be unable to give you definite assurance on this point. As I mentioned on several occasions, we are trying this out but do not feel that our experiment has gone far enough to warrant drawing conclusions. I can go this far and say that in the three years we have been conducting the experiment we have not seen any detrimental effects, the most of the grove has not yet reached good bearing age. Some people seem to have the impression that by one complete fertilization a year is meant just the usual application at that time. For instance, if you put on the complete fertilizer in the spring, they think you should use a 4-8-4 the same as tho you were going to fertilize three times. This is not the case, however, for you cannot expect the trees to get along as well on 1-3 as much phosphoric acid and potash. This is especially true of the potash, for the citrus fruit contains a higher percent of potash than any other element. One box of oranges for example removes 3-8 lbs. of potash figured as sulfate of potash, from the soil, or every 8 boxes removes 3 lbs. of sulfate of potash from the soil. This is equivalent to an application of about 28 lbs. of a 5% potash fertilizer.

In the case of phosphoric acid which is not leached to any extent and which is not used in as large amount, you could probably get along with less than is used at present. Eight boxes would remove about 1-3 of a pound of phosphoric acid. We would suggest that if you care to try out this one complete fertilization a year, you use a formula containing about 16% phosphoric acid and 15%—16% of potash. For late fruit, the

fall would in my opinion be the best time to apply the complete fertilizer while for early fruit the summer would seem to be the best.

On the question of the best amounts of potash to use, we still feel that 5% three times a year is sufficient to produce good crops. We do not yet know what effect this amount has on the carrying or keeping quality of the fruit. We hope to get some information on this phase of the question this coming season.

As regards sources of potash, we believe that on the East Coast soils, such as are found along the Indian River, the muriate can be safely substituted for the sulfate on oranges. We are not so certain as to the possibilities of substituting the muriate for sulfate for grapefruit. In the Ridge Section our grove is just beginning to bear so it is too early to draw any conclusions.

As many of you know, I have never been a great advocate of home-mixing of fertilizers. This is for two reasons, one—that too often the man will not give his personal attention to the mixing and secondly, because I have mixed enough myself to know that there are much pleasanter jobs. However, if you experience difficulty in obtaining the all-mineral mixtures or the more concentrated mixtures at a reasonable price, I would suggest that you mix your own. In order to simplify the working out of the formulas as much as possible, I have prepared two tables which you can obtain for the asking. In making up all-mineral mixtures you should remember that such mixtures should be used within 24 hours or they will harden up. For this reason most of the all-mineral mixtures you buy from the fertilizer companies contain a small amount of organic material in order to keep the fertilizer in good mechanical condition.

The price of organic nitrogen compounds are lower today than they have been for some time, however, I believe that this is only a temporary condition. With a short corn crop in the west, more of the high grade organic materials will go into the feeds. As they can afford to pay more for these materials for feed than you can pay for them as fertilizer, the price is bound to go up. The price for inorganic is going lower, however, so that there will be a still greater difference between the all-mineral and the organic nitrogen mixtures. This brings up another matter, namely, the need of a more up-to-date fertilizer law. As many of you probably know, a new law was passed by the last legislature. Due to the fact that it went too far, the manufactur-

ers were able to get a permanent injunction against it. We hope that the next legislature will pass a law which will give the farmer the information he wants and needs.

I fully realize that we should have more experiments scattered over the State testing out the various sources of nitrogen, potash, etc. However, you must remember that our funds are very limited. We are planning to expand our source of nitrogen tests this fall if we can get sufficient cooperation from some of you growers. We plan to ask the grower to pay for the fertilizer and apply it under our direction and supervision. This is the only way that we can see by which we can increase the number of tests. In addition, we want to begin some tests to determine the phosphoric acid needs of the citrus tree. There are other problems which we would like to study, such as the effect of larger amounts of organic matter on the growth and quality of citrus as well as on the conservation of fertilizers. Are some of these rarer elements such as copper, boron, zinc, and manganese needed? On the East Coast, we have the problem of citrus growing on marl. Another is the decline of citrus. Is this due to a disturbed soil condition or is it due to some organism? Can we change the soil condition in such a way as to make it unfit for the organism? These are but a few of the problems which demand attention.

Farmers Week Shows Increasing Attendance

That Farmers' and Fruit Growers' Week at the College of Agriculture is becoming an institution of no little importance in the state is evidenced by the fact that ninth annual event of this kind, which closed August 15, was attended by 1,700 men and women, the largest attendance in the history of the event. The interest displayed by the visitors in all phases of the program was encouraging, also.

Facilities of the University of Florida were thrown open to visitors at very reasonable rates, and many of those in attendance spent the entire week at Gainesville. The week provided them instruction which was interspersed with recreation and inspiration.

The program was divided into sections relating to citrus and small fruits, truck crops and ornamentals, farm crops and livestock, poultry, beekeeping, and home economics. All sections held programs at the same time, and many visitors regretted that they could attend only one sec-

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Gummosis and Psorosis of Citrus Trees

By W. J. Bach, Pathologist Texas Substation No. 15 in Texas Citriculture

In combatting plant diseases of any kind the most desirable, and usually the least expensive means, consists of prevention of the disease rather than in the treatment after the disease has gained a foot-hold. This is particularly true in the case of the gum diseases of citrus. A little additional care in many of the operations in the grove may prevent an injury to the bark of the tree which might otherwise prove to be the initiation of some gum disease. Particularly is this true of the "picking" operation. Pickers should be cautioned to be careful not to skin the tree and especially not to climb on the branches. However, since it is impossible to prevent the occurrence of all gum disturbances on citrus trees we should consider the nature and symptoms of certain diseases and also the methods of treatment.

The success or failure of the citrus grower finally depends largely upon the proper solution of various problems that are encountered, such as fertilization, cultivation and irrigation. The losses caused by such diseases as gummosis and Psorosis or scaly bark are often underestimated. The reason is that, in the first place, these troubles in the early stages may show an actual increase in yield, and in the second place, the progress is so slow that the grower does not realize the yield reduction which occurs later. A reduction in yield ranging from 4.7 per cent to 19 per cent was found in one grove in California in a check of 30 affected trees as compared to healthy trees. Another grove in California showed a loss ranging from 19.2 per cent to 22.3 per cent in yield of pounds of fruit per tree on thirteen affected trees as compared to healthy trees. These figures show that gum diseases cause the yields to decline and as they become serious the profit from the grove is materially affected.

Physiology of Gum Diseases

Citrus trees, like stone fruit trees and a number of others, have a strong tendency to gum. Gum formation is apparently a natural response to injury and the situation may be mechanical, chemical, physiological, or due to invasion of fungi or insects. Minor gumming may be caused by less significant factors but when it becomes severe or chronic it is com-

monly termed "gummosis."

The apparent stimulated yield which often follows the early stages of various types of gum diseases is easily explained if we consider the normal physiology and structure of a citrus tree and the effect of such diseases on it. In almost every case the bark outside of the cambium or growing layer is affected causing a distortion and disturbance within the area. This is the region through which the elaborated plant food is transported down to feed the root system and the disease area, if extensive, tends to interfere with this process. This results in an accumulation of food in the portion of the tree above the diseased area which stimulates fruit bud formation and fruit development, producing an effect similar to ringing. This accounts for the increase in production which is often noticed. In the meantime the root system begins to suffer from the lack of this elaborated plant food, which must be supplied from the leaves; its development ceases and it becomes less efficient in absorption. Eventually the top begins to suffer from lack of nitrogen and other elements which the devitalized root system cannot supply. The tree then begins a decline which is soon reflected in reduced yields.

The various Citrus diseases characterized by the formation of gum cannot be diagnosed by the occurrence of gum itself since its nature and appearance is essentially the same regardless of the influence that induced its formation. The process of gum formation is a pathological condition in which the cell walls of the tissue involved breaks down either partially or entirely. This transformation apparently results from enzyme activity and may change the walls of entire cells into gum while they are still in the development stage. When gum forms in sufficient quantity to rupture the bark by the internal pressure exerted the exudation on the surface occurs. It is not merely the appearance of the gum but the death of areas of bark that is menacing the life of the trees where these symptoms appear.

Characteristics of Gummosis

As already stated, gum formation in citrus is a common phenomenon in connection with a number of differ-

ent diseases, although it is more evident with some than with others. Since the gum is of the same nature under whatever influence it has been formed, it is not a diagnostic character in itself, but must be considered in connection with other symptoms. Gummosis appears as small cracks in the bark of the trunk and larger limbs from which gum exudes and usually runs down the bark. The gum hardens and collects on the bark and in the cracks. Later the bark becomes discolored on both sides of the ruptured place and dies. Gum formation underneath may separate the bark from the wood. As the disease progresses, adjoining areas become affected. The bark about the older cracks becomes hard and is forced up as the remaining live bark underneath begins to callous over. In some cases the affected areas may heal but usually the disease breaks out anew later in advance of the old area. In advanced cases the bark may become scaly and large portions of the trunk or branches become involved. In some cases where the disease does not seem to be very serious the cracks in the bark may provide a place for entrance of other wood decaying organisms and large areas may be killed within a short time not infrequently resulting in the death of the trunk or large limbs of the tree.

Characteristics of Psorosis

Psorosis appears as more or less circular areas in which a thin layer of the outer bark dies and scales off, leaving a new layer of living bark underneath. It is very difficult to recognize in the early stages but becomes conspicuous in more advanced stages. As the disease progresses the outer bark breaks up into scaly flakes which curl away from the trunks or branches as they slough off. The disease is characterized by a continual breaking out of the bark in advance of the limits of the lesion and a subsequent healing of the affected area with irregularly roughened brownish bark. Little or no gum exudation accompanies the disease until the inner bark and cambium have become involved and then the gum flow is usually confined to scattered drops at the ends of the lesion. In the later stages the wood may become

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Soda Beverages

Committee Proposes Definitions for Soda Beverages and Flavors

The Food Standards Committee has proposed definitions for root beer, root beer flavor, birch beer, birch beer flavor, cream soda water, cream soda water flavor, orange soda water, orange soda water flavor, lemon soda water, lemon soda water flavor, lime soda water, and lime soda water flavor. W. S. Frisbie, chairman of the committee announces. The committee invites criticisms and suggestions regarding the proposed definitions from food officials, consumers, the trade, and all others interested. Communications should be addressed to A. S. Mitchell, Secretary, Food Standards Committee, Food and Drug Administration, U. S. Department of Agriculture, Washington, D. C., and should reach him not later than August 31, 1930.

The proposed definitions are as follows:

ROOT BEER is the carbonated beverage prepared from potable water, sugar (sucrose) sirup, and root beer flavor, with or without caramel color, and with or without harmless organic acid.

ROOT BEER FLAVOR, ROOT BEER CONCENTRATE, is the beverage flavor in which oil of sassafras

and methyl salicylate (or oil of wintergreen or oil of sweet birch) are the principal flavoring constituents, with or without caramel color.

BIRCH BEER is the carbonated beverage prepared from potable water, sugar (sucrose) sirup, and birch beer flavor, with or without caramel color, and with or without harmless organic acid.

BIRCH BEER FLAVOR, BIRCH BEER CONCENTRATE, is the beverage flavor in which methyl salicylate (or oil of sweet birch or oil of wintergreen) and oil of sassafras are the principal flavoring constituents, with or without other flavoring substances, and with or without caramel color. Methyl salicylate is the predominating flavor of the product.

CREAM SODA WATER, "CREAM SODA," is the carbonated beverage prepared from potable water, sugar (sucrose) sirup, and cream soda water flavor, with or without caramel color and with or without harmless organic acid.

CREAM SODA WATER FLAVOR, CREAM SODA WATER CONCENTRATE, is the beverage flavor in which the principal flavor is derived from vanilla, tonka, vanillin, or cou-

marin, or any combination of them, and contains other flavoring substances, with or without caramel color.

ORANGE SODA WATER, "ORANGE SODA," is the carbonated beverage prepared from potable water, sugar (sucrose) sirup, orange soda water flavor and citric acid.

ORANGE SODA WATER FLAVOR, ORANGE SODA WATER CONCENTRATE, is the flavoring product in which oil of orange, or terpenless oil of orange, is the essential flavoring constituent.

LEMON SODA WATER, "LEMON SODA," is the carbonated beverage prepared from potable water, sugar (sucrose) sirup, lemon soda water flavor and citric acid.

LIME SODA WATER, "LIME SODA," is the carbonated beverage prepared from potable water, sugar (sucrose) sirup, lime soda water flavor and citric acid.

LIME SODA WATER FLAVOR, LIME SODA WATER CONCENTRATE, is the flavoring produce in which oil of limes, or terpenless oil of limes, is the essential flavoring constituent.

Arizona's Citrus Crop May Be 20 Per Cent Larger

A citrus harvest between 10 and 20 per cent greater than last season is predicted by Irving de R. Miller, manager of the Arizona Citrus Growers' Ass'n, which is allied with the California Fruit Growers' Exchange and markets nine-tenths of the citrus produced in Maricopa County.

Miller has inspected practically every grove in the Association's control and finds that on the whole the set of grapefruit is not so good as it was in 1929, but he declares that there never was a better set of oranges. Navel, Valencia and Sweet Seedling trees held their fruit unusually well through the June drop period and are now loaded. Counting the new groves coming into first production, other groves that are a year nearer to productive maturity and the excellent crop in the old groves, there should be a 20 per cent higher yield than a year ago.

In a majority of the grapefruit groves conditions are about normal. Some of the trees lost part of their

blooms in the hot spell of early April and a May hailstorm caused some fruit to drop, so that a few growers are complaining of poor set. But Miller thinks that increased size of the matured fruits may make up for this almost entirely. His estimate is for 10 per cent more grapefruit.

Last season the Association handled 300,000 field boxes of Marsh Seedless grapefruit, 50,000 of Clayson seeded grapefruit, 85,000 Navels, 17,000 Valencias, 22,000 Sweet Seedlings, 9,000 lemons, and 2,300 tangerines.

The main packing house of the Association, in Phoenix, is being overhauled and all equipment reconditioned preparatory to reopening in early September. A branch packing house at Mesa is under construction and will be ready at the same time.

FLORIDA BOY TO SPEAK AT CONTEST IN ATHENS

Mallory Roberts, of Crescent City,

will represent Florida at the Southern Regional Future Farmers of America Speaking Contest to be held in Athens, Georgia, October 25. He will compete with winners from the other Southern states for a chance to be one of the four district speakers who will compete for the national title at Kansas City.

Grey Miley, Plant City, vice-president for the South, will preside at the contest in Athens.

SOUTH FLORIDA POULTRY COOPERATIVE ORGANIZED

The South Florida Poultry Cooperative has just been organized, and a large number of poultrymen from Martin, Palm Beach, Broward, and Dade counties have signed contracts to begin with the Association September 1, C. E. Matthews, county agent at Fort Lauderdale, reported.

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IMPORTANT BY-PRODUCTS EXPANSION

The expansion of the citrus industry along by-products lines is making such rapid strides that few Floridians are aware of the wonderful development. Even among citrus men themselves, the magnitude of the recent expansion is only partially realized.

Less than ten years ago the writer was told by one of the then leaders of the industry in the state that by-products would never become an important factor in the industry; that the canning of citrus fruits, the bottling of citrus juices or the handling of citrus other than in its natural state, was but the dream of theorists who would never live to see their dreams come true.

That was less than ten years ago. Today, citrus canning plants stand ready to care for one-fourth of the entire grapefruit crop of the state, to say nothing of the fruit which will be used in the preparation of bottled juices and other by-products.

Last year there were approximately fifty canning plants in Florida engaged in the canning of grapefruit for the market. This year the number will be increased by at least one-third, while production will probably be doubled. New plants are being erected all over the citrus belt and old plants are being improved and enlarged.

In Tampa alone three concerns of international scope are now preparing to enter the field on an extensive scale. The Del Monte people already have a plant of magnitude under course of construction, and expect to be ready to operate with the opening of the season. Tom Huston, affiliated with the Dupont interests, has announced that a canning and freezing plant will be established in Tampa for the canning of grapefruit, the development of all citrus by-products and the freezing of juices and fruits for shipment. Still a third national organization, not less important than the two named, though its identity is not being divulged, has taken options on property for the site of a canning plant and hopes to be in the field before the close of the present canning season.

At other points in the Florida citrus belt similar activity is seen in the erection of new plants and the enlargement of old ones. The Florida Citrus Exchange has been active in interesting national concerns to locate plants in Florida with a view to providing Exchange members with a profitable outlet for the cannery grade fruit and relieve the general market of the competition heretofore existing when such fruit was offered on the auctions in competition with fancy grades.

With this new outlet provided for cannery grapefruit and with the ever increasing demand for both orange and grapefruit juices, the by-products industry has already attained proportions which even the most far-seeing leaders were unable to vision a few short years ago—and the industry is only beginning its development.

A SIZEABLE RETURN

Based on figures prepared by L. M. Rhodes, state commissioner of markets, Florida citrus growers received \$52,757,313 for their crop of last season, of which sum, according to the same figures, \$18,108,664 was net. This is based on a total crop of 16,824,600 boxes. The average return to the grower, according to Commissioner Rhodes, was \$3.30 per box on oranges, \$3.05 on grapefruit, and \$3.50 on tangerines. Commissioner Rhodes places the average cost of production, packing and marketing at \$2.00 per box.

While it is probable that there will be some who will question the accuracy of the figures given by Commissioner Rhodes, they are probably the best index available as to both the size and value of the 1929-30 crop. The grower who failed to make his \$1.10 net per box may be inclined to wonder where the Commissioner got his figures or what became of his share of the average profit. He is apt to forget that there were a lot of other growers, who by reason of fancy fruit or fortunate market, or both, netted much more than the average profit on his fruit to offset the lighter profit of the unfortunate grower.

Commissioner Rhodes has been figuring the total yield and value of Florida citrus fruits for many years, and his figures are doubtless as nearly accurate as can be obtained from any quarters. At any rate, an aggregate of fifty-two and three-quarter million dollars for Florida's citrus crop is not to be sneezed at, and the eighteen million dollars net to the grower marks him as the greatest single factor in Florida's industrial life.

THE GREEN FRUIT LAW

When the legislature two years ago amended the "green fruit law" in accordance with the demands of citrus interests, it was believed that the problem of shipping unfit fruit to market had been solved. The present season, however, appears to demonstrate that we are about as far from a satisfactory solution as ever.

According to the statement of Commissioner of Agriculture Mayo, every car of citrus shipped from Florida so far this season has passed

the maturity tests without question, yet it is said that much of the fruit has been unfit for human consumption. This condition was responsible for a meeting held in Winter Haven on September 8, at which time more than 300 growers and shippers were present to discuss the problem with Commissioner Mayo.

At this gathering it was unanimously decided to support Commissioner Mayo in any steps he might take to prevent the shipment of any unfit fruit from the state. In order to effect this result, it was decided to appoint a committee of eighteen to formulate rules for the guidance of shippers. This committee consists of six members of the Committee of Fifty of the Florida Citrus Growers Clearing House Association; six members of the operating committee of the Florida Citrus Growers Clearing House Association, and six Florida business men named by Commissioner Mayo. This committee will endeavor to formulate rules which will protect the consumer of citrus fruits against fruit which may be unfit though technically ripe according to the prescribed acid tests.

It is hard to say just when citrus fruit is ripe, but it is possible to lay down arbitrary rules governing the sale of fruit until certain tests have been passed. It is easy to tell when citrus is fit to eat, but it is next to impossible to lay down shipping rules which will govern the case. If all growers and all shippers were content to wait until the fruit they ship is fit to go on their own tables, there would be no problem to solve. But each year there are growers and shippers who are anxious to get the "high dollar" commanded by the early fruit, regardless of the consequences on the later market, and fruit which may pass the maturity tests and still be unfit to eat finds its way into Northern markets to the detriment of later shipments and the ruination of prices.

The committee offers a solution which has been accepted by Commissioner Mayo, by suggesting a juice content test graduated according to the various sizes of fruit. The committee should have the united, ardent and unfailing support of every grower and shipper who has the welfare of the industry at heart.

THE FLY SITUATION

There is every reason to believe that Florida has definitely whipped the Mediterranean fruit fly—the first time in the history of this sub-tropical fruit pest that any country in which it has made its appearance has come out victorious over the fly.

This does not mean, however, that there should be any relaxation in the efforts which have been and still are being made to insure the complete eradication of the pest. These efforts should be continued until it is positively established that not a single fly nor the larvae of a fly remains in the state. They should continue until the United States Department of Agriculture is satisfied on this point and has by official decree released Florida from every vestige of restriction as to the shipment of fruit into every section of the Union—so far as governmental decree may be operative.

Recent relaxation of the restrictions as re-

gards a large portion of the territory which last season was closed to Florida fruits has had a wonderfully stimulating effect upon the trade at large. Florida and Florida growers should not be content until these same relaxed rules become operative for the country as a whole. So long as there remains even the slightest possibility that there may still be one fly lurking about the Florida groves, much of the most profitable territory for the sale of Florida citrus will remain closed to our fruit.

It is to be hoped that restrictions applying to Southern territory may be relaxed before the present shipping season is well under way. The only way in which this may be brought about is by the most hearty and complete co-operation on the part of growers in assuring the total annihilation of the pest by observing the clean-up rules laid down by the federal authorities in charge of the eradication work. The sooner we achieve the end desired, the sooner will we reap the benefits in dollars added to our bank accounts.

NEED CLOSER CO-OPERATION

Sooner or later, the citrus growers of Florida, California, Texas and Arizona will find it imperative to co-operate more fully and more intensively than they have ever done before.

Almost at the inception of this publication we began an agitation for closer affiliation of the growers and shippers in the several citrus growing states. At the time, the idea did not apparently appeal to the growers of any of the states—at any rate there was no apparent rush to get onto the band wagon. Of late, however, there has been evidence that the seed sown so many years ago is beginning to take root. From both California and Texas come evidences to this effect.

Of late, citrus publications in Texas and California have commented favorably upon the suggestion of The Citrus Industry that closer co-operation between the states is essential, and the same spirit of recognition of this necessity has been manifested by leading growers in each of the four citrus producing states.

The Citrus Industry is confident that sometime and in some form such closer affiliation of the nation's citrus growers will be brought about, to the great benefit of the industry as a whole and to the growers in each of the states.

There may be some good reason why your crop is not up to standard of quality; but usually, when sifted down to rock bottom, the trouble will be found to be YOU.

One trouble with the citrus industry is too many factions based upon too few facts.

The best grower is the one who habitually grows the best fruit.

When in doubt, hold your fruit until you KNOW it is fit to eat.

CITRUS COMMENTS

—BY—

Charles D. Kime, Orlando, Florida

This department is devoted to furthering horticultural interests of Florida. Letters of inquiry, discussion or criticism will be welcomed.

Two Important Papers

There are two papers in this issue that are deserving of special comment and discussion because of their importance to citrus growers at this time. Both were presented by their authors at Farmers Week held by the State University at Gainesville this past month.

The first of these papers by Dr. B. R. Fudge, Assistant Chemist of the State Experiment Station, located and working at Lake Alfred, reports the progress made to date in some investigations of soil acidity. His title "Soil Acidity and Its Relation to Growth of Citrus," deals with a subject that has received considerable attention during recent months from "The Citrus Industry," and because of its importance will continue to receive more attention in the future. We hope that each reader will go over the material in the papers with more than the usual care.

In this preliminary investigation in the relationship of "Soil Acidity to Fruit Production" Dr. Fudge points out and emphasizes very clearly some important and valuable relationships that can well be kept in mind by all growers located on RIDGE LAND as the deductions of value apply directly to results obtained on such soil types.

LIMEING. A number of years ago limeing of citrus groves was a rather common practice. It took several years for us to realize that this was proving harmful on our light sandy soils. The interesting feature in the example of limed groves given in the Doctor's paper is that the actual soil pH does not have as much bearing as would be expected considering condition of the grove. The limed groves of several years standing were not in ideal condition but the pH given for these properties does not indicate excessive alkalinity unless the pH 5.6 to 6.7 given in example no 4, should hold true for all of the lands of the ridge type, and trees within this range prove to be above the optimum for such soil types. Since we do know that a low-

er pH range is not injurious it would seem good practice to lower the reading by increasing the acidity in groves that are in bad shape from limeing. The paper does not establish that the pH is the cause of the limed groves being in bad condition but it does indicate rather clearly that when the reading rises to a point above pH 6.0 in the sandy hill sections that the buffer action of the balancing soil materials, (other fertilizers, etc.) was insufficient to prevent injury from calcium applied as ground limestone, or applied as any product of burned lime such as hydrated, quick lime, etc. Other forms of calcium have been used successfully and form an important part of our fertilizing program.

The actual effect of lime on citrus would be intensely interesting to us since we know how beneficial it is to truck crops and to the farmer of clay lands and other heavy soil types. Also we know that calcium is necessary for proper growth, but evidently citrus must have its calcium disguised in some other form than as lime.

OPTIMUM pH. An extremely interesting comparison of the differences in soils is shown in the pH readings taken from ridge lands as contrasted with that found in one East Coast Grove, two groves from the Plant City section and others taken from low land.

The lower soil types seem to give a much higher reading toward the alkaline side of the pH scale and still the groves are in excellent condition. In fact there seems to be sufficient basis even from the examples given to conclude that East Coast soils will handle citrus satisfactorily when close to the neutral point and that other low heavy type soils are still in good condition when nearly or quite neutral. The interesting question is immediately raised as to why the difference? I am inclined to doubt very much that it is a fundamental difference that cannot be imitated on high land. No explanation so far offered seems to fit the conditions but we are actually making progress by a process of imitation. With the newer fertiliz-

er materials mentioned in the article by Dr. Ruprecht progress will be faster during the next few years than it has been in all of our past work put together.

Dr. Fudge has definitely increased our knowledge of the optimum range for acidity in citrus soils, which is a fact of no little importance. It is a necessary basis for working out other relationships.

PROBLEMS IN WHICH pH READINGS WOULD HELP. Since Dr. Fudge's paper deals with a rather narrow range of examples we find in it very little to help us in fertilizing old bearing groves. The effective range of the soil acidity in which they may operate is likely to prove very narrow; nothing like as wide as with young groves or those in which the soil is yearly benefited by cover crops. Such groves are usually close headed and continually robbed of the usual forms of organic matter. They represent our heaviest bearing properties. In grove No. 10 example No. 9 we find the only example of older trees and it indicates less soil acidity than the average for younger trees. It will be very interesting indeed if further work along this line shows that older groves should operate closer to the neutral point than those still in vigorous growing condition.

Other problems dealing with soil pH that seem of real importance to us would include differences in action of root-stocks. The East Coast and low lands are largely planted to sour. There are plantings of lemon and seedlings in such locations as well. Soil differences could easily account for some problems now confronting many growers. Differences in varieties have already been indicated. This is especially true of grapefruit and round orange. Grapefruit will maintain itself on alkaline soils with success tho its alkaline range is still unknown. Bearing quality, splitting of Valencias and of other varieties are further examples of problems on which the pH readings might shed some light.

(Continued on page 22)

BLUE GOOSE NEWS

Monthly News of American Fruit Growers Inc.



Edited by The Growers Service Department

VOLUME 4.—NO. 10

ORLANDO, FLORIDA, SEPTEMBER, 1930

PAGE 1

DOPE ON WEATHER, WHY WE HAVE IT, AND HOW!

Herbert Janvrin Browne, the more or less well-known long range weather forecaster, told the apple conventionites at Grand Rapids lots of things about weather and why we have it that they did not know before. The recent extraordinary hot and dry spells made his talk particularly appropriate and, although his lingo contained such high-hat words as abyssal, apogee, perigee, hydrostatic, et cetera, delegates listened with surprising attention.

Certain definite sun and moon influences control the weather of the world, he said, and he went on to outline the cosmic forces and their precise cycles, which give us whatever weather we are having. A mere layman, cannot hope to repeat the technical-sounding description he gave.

Mr. Browne's most interesting statement was as to the causes of the recent disastrous drouth, the worst since 1874.

In this instance, he explained, the Azorean cold water area had been spread westward by the moon's horizontal tidal influence during its recent high northern declination. This westward movement had been strengthened by the moon having its perigee positions well to the north. The moon in perigee exercises a tidal pull 30 per cent greater than when it is in apogee, the perigee being its nearest approach to the earth. The result of this expansion had caused the winds that rotate to the right around the Azorean area to come into the Gulf of Mexico and the Caribbean Sea at a high temperature, developing high pressures, which prevent anything save showers in the way of rainfall. To this condition had been added the heating effect of the sun, whose radiation had been at an unusually high point.

The reason for the sun's high radiation was that the sunspots had dropped to a low point. This frees the sun's disk from the clouding effect

Continued on page 2

FIND BLUE GOOSE FAVORED IN MANY MARKET CENTERS

Returned to Orlando after extended trips around the principal citrus markets in the United States where Florida fruit is distributed, Salesmanager C. N. Williams, and Assistant Salesmanager Allen W. Wilson have gratifying reports to make concerning the favor in which the Blue Goose trademark stands in the consuming centers.

Contacts with principal trade factors at the summer conventions and in their respective places of business are said to have revealed a considerable satisfaction with the Florida citrus fruit which last season went to market under the Blue Goose trademark, in comparison with other fruit offered, and opening of the new shipping season will find a large portion of the trade favorably prejudiced toward Blue Goose fruit.

Experiences in the deciduous markets during the generally most unsatisfactory months this summer are pointed to as demonstrating the popularity which the Blue Goose designation is held by both trade and consumers alike. The shift of public buying habits, and the tendency toward thriftier and more careful purchasing have emphasized the value of Blue Goose advertising and merchandising to those growers whose products have been so distinguished.

The conference of executives of the American Fruit Growers Inc. from all sections of the country, held in Pittsburgh in August, and in which Mr. Williams participated, was fruitful of plans for even further strengthening the great sales force which represents growers served by the American Fruit Growers Inc. in more than two hundred domestic and foreign markets. The work of the salesmanagers of the various shipping divisions will be aided by even more intensive work upon the part of the district salesmanagers, each of whom supervises selling activities in

Continued on page 2

OUTLOOK IS GOOD FOR SATISFACTORY SALES By C. N. Williams, Salesmanager

The outlook for Florida citrus seems good, in spite of what many see as deterrents against a successful season. It is true that the general business depression over the North has during the summer resulted in scaling down prices of perishables to a very low level. However, it is notable that in the face of extremely unsatisfactory prices for the general run of deciduous fruits, all citrus fruits which have been coming to market during the past month or six weeks have been obtaining exceptionally satisfactory prices.

Oranges, grapefruit and lemons all have been selling exceptionally well, in good volume and at excellent prices. Nothing could better exhibit the now established American habit of consuming citrus fruits, for the prices of many deciduous fruits at the same time have been extremely low.

During the summer California shipped more grapefruit East than ever before; and it sold well. Grapefruit from the Isle of Pines has been arriving in the Eastern markets in good volume, and has commanded generally satisfactory prices. It is reported to be of very satisfactory eating quality, as well as of good appearance, and has been well received. The fact that eastern buyers have been reported as diverting large quantities of this grapefruit to mid-western markets shows the general demand which grapefruit recently has had.

The fact that the public already has become accustomed to eating grapefruit should exert a favorable influence on the demand for Florida grapefruit as it begins to arrive.

Notwithstanding the general business stagnation, and the large unemployment in many centers, my rounds developed the existence of an underlying optimism in business circles which indicates that the situa-

Continued on page 2

BLUE GOOSE NEWS

OFFICIAL publication of the American Fruit Growers Inc., Growers Service Department, published the first of each month in the interest of the citrus growers of the state of Florida.

EDITORIAL ROOMS
Sixth Floor, State Bank Bldg.
ORLANDO, FLORIDA



ASSURANCE

After the interruption of the late lamented real estate activities, and other things, the business of citrus growing in Florida is once again getting into its stride. The great industry which for so many years has been the backbone of the peninsula again is coming into its own.

Once more practically every other line of activity is correlated to citrus activities, and bankers and business men take their keynote from the citrus situation. Oranges, grapefruit, tangerines, are focal points for the attention of thinking leaders everywhere in Florida.

The situation points to continued, steady progress, with a gratifying measure of stability.

Generally speaking, the groves which constitutes Florida's great winter fruit factory are in good condition. The credit situation is greatly improved; growers generally are in much more comfortable circumstances. Those business concerns which depend for their prosperity upon supplying the requirements of groves and growers once again are doing a satisfying business, and are in an optimistic frame of mind.

Packing facilities everywhere have been improved and enlarged, so that there is no concern over their adequacy. Restrictions which hampered the distribution of the citrus crop have been largely relaxed, and indications at this writing apparently point to even further relaxation. Uncertainty no longer clogs normal cit-

Adv.

rus progress. Pessimism is no longer popular.

Already there are signs of improvement in general business over that portion of the country to which the Florida crop will be shipped; and prospects for further and continued improvements apparently indicate a return of prosperous conditions to the country at large by the time the bulk of the Florida citrus crop will be ready to move.

The Florida Citrus Growers Clearing House Association now provides a machinery for coordinating all marketing efforts which is a decided asset to the industry. Through its operation the Florida industry now presents a united front to the outside world; and is enabled to function effectively as a whole.

There is a calm assurance in citrus circles which argues well for Florida being able to make the best of whatever situation it may face; and points to continued forward progress.

Only grove values fail to reflect the much improved situation. Grove values, as reflected by recently reported transactions in groves, are too low. Intrinsically, good, producing citrus properties are worth more than they are at present bringing.

Given a cessation of agitation concerning this and that in citrus production and marketing in Florida, and undoubtedly grove values will shortly reflect the bettered situation.

It is a time for assurance, and understanding optimism.

OUTLOOK IS GOOD FOR SATISFACTORY SALES

Continued from page 1

tion may clear up well before the time when we in Florida have any large quantities of fruit going forward. There was a general consensus of opinion that October will see a resumption of employment in industrial lines which will do much to restore prosperity over a large part of the country; and thus will add very materially to the public's buying power.

The American Fruit Growers Inc. maintains the largest number of sales representatives of any concern handling domestic fresh fruits and vegetables.

DOPE ON WEATHER, WHY WE HAVE IT AND HOW!

Continued from page 1

of the sunspots, so that high radiation reaches the earth to such an ex-

tent that the United States from these combined influences has seen all heat records broken.

These elements recur, as repeated bulletins of the Long-Range Weather Forecast Service have stated during the past six years, once in 55.8 years. Subtract 56 years, the nearest full year period to 55.8 years, from 1930 and one arrives at 1874, when the same astronomical and oceanic elements produced the hot Summer and drouth to which the Weather Bureau refers for comparison with the present heat wave. Now subtract 56 years from 1874, and 1818 is discovered. In 1818 the Great Lakes were at the lowest level ever recorded before or since as a result of several years of drouth, due to the same astronomical and oceanic conditions as in 1874 and in 1930. And there you are!

The American Fruit Growers Inc. was an active participant in the "Eat More Fruit" advertising campaign of British fruit handlers to the British consuming public. The campaign has been a pronounced success.

FIND BLUE GOOSE FAVORED IN MANY MARKET CENTERS

Continued from page 1

his allotted territory.

Plans for enlarged and most effective advertising and merchandising effort, to supplement the work of the salesmen in the markets, were gone into carefully and given spontaneous approval. Vigorous and aggressive campaigning is expected not only to keep Blue Goose fruits to the forefront as in the past; but to add even more to their deserved popularity with the trade and consumers.

BAGGS ON BOARD OF APPLE ASSOCIATION

At the annual meeting of the International Apple Association in Grand Rapids in August, William H. Baggs, vice-president and general manager of the American Fruit Growers Inc. was reelected a director, and again took place upon the executive committee of the board for the coming year.

Mr. Baggs long has been identified with activities on behalf of the betterment and simplification of trade practices in the produce trade; and is generally credited with contributing much toward the development over a period of years of higher standards of ethics in perishable foodstuffs transactions.

The Blue Goose trademark in ten years has reached a place in public popularity equalled only by some others which have been before the public for very long periods.

APPLE CROP SHORT OF FIVE YEAR AVERAGE

Notwithstanding the fact that estimators agree the crop of early apples is a heavy one, assuring heavy supplies in the markets up to Thanksgiving, the crop as a whole is estimated as lighter than the average for the preceding five years. This seemingly indicates much shorter supplies later, as the season progresses.

The United States Department of Agriculture forecasts a total apple crop this season of 145,388,000 bushels and a commercial crop of 28,964,000 barrels. This about equals last year's total of 142,078,000 bushels and commercial crop of 28,973,000 barrels. Compared to the average of the five years from 1924 to 1928, the present figures indicate a 10 per cent decrease from the average commercial crop for that period, which amounts to 32,373,000 barrels.

With the exception of 1927, the commercial apple crop for the past five years exceeded the crop harvested last season as well as the crop expected this year. Thus it is noted that in 1929 the commercial crop amounted to 28,973,000 barrels; in 1928 it hit 35,268,000 barrels; in 1927 the

total was only 25,900,000 barrels; in 1926, the big crop year, the amount was 39,411,000 barrels; in 1925, the figure stands at 33,044,000 barrels, and in 1924 it touched 32,468,000 barrels. Therefore, a crop about 15 per cent below "normal" may be expected according to present estimates.

A sales agency should be precisely that. The American Fruit Growers Inc. adheres strictly to the business of making sales of fresh fruits and vegetables for its thousands of grower-clients, avoiding all side issues and other activities which might prove distracting.

HOW MUCH FAMILIES SPEND FOR FRUIT

The United States Department of Commerce recently utilized one hundred families of employees of the Ford Motor Co. for the purpose of a survey of living costs and family budgets. The survey brought out some interesting facts with relation to what might well be called average family expenditures for fruits in the Dearborn, Michigan, area.

Food, naturally enough, took the biggest part of each family's expendi-

tures, averaging thirty-two per cent of the average income. Rent took twenty-two per cent, and clothing twelve per cent of the average family income.

Of the total expended for food-stuffs approximately six per cent went for fresh fruits, with apples and oranges far outranking any other fruits in popularity. Each family consumed an average of 186 pounds of apples and 102 pounds of oranges yearly. Bananas came third with 67 pounds to the family; lemons 11 pounds and grapefruit 6 pounds.

The average cost of apples for each family was found to be \$10.10 for the 186 pounds consumed. The cost of the oranges was \$9.56 for the 102 pounds which they used on the average.

One hundred per cent of the families in question used oranges each year. Ninety-nine per cent of the families used apples and bananas; and ninety-seven per cent bought lemons. Thirty per cent of the homes bought grapefruit.

The American Fruit Growers Inc. long has rated as one of the largest exporters abroad of American grown fresh fruits.

UNIFORMLY



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Successful selling measures
every grower's prosperity

American Fruit Growers Inc.

Orlando - - Florida

Why I Like Florida

By Howard A. Kelly, M. D., Emer. Prof. Gynecological Surgery, John Hopkins University, Baltimore, Md., in "Orange Echoes".

It is not difficult for me to say, "Why I Like Florida," but it is indeed hard to give adequate expression to my strong preference. In common with thousands I prefer Florida to our northern states because while they are chilled in their ice and snow mantle, Florida ever has a warm heart beating right on the surface, to dissipate with her welcome the northern chill.

Therefore, I like Florida in winter for the same reason northern Europeans like Italy, swarming through her mountains and lake resorts, revelling in her bright colors, and returning home laden with souvenirs for the less fortunate. I love the tropical scenery of our Florida, her trees and plants, her lakes and hills, her bayous and shores, and all her beautiful and interesting bird and animal life.

As a herpetologist, deeply interested in reptiles and especially in snakes I bear but one grudge against my adopted State in the spring, and that is she bears a reputation for snakes she does not deserve and cannot sustain. I can gather more rattlesnakes within a few hours of New York City in a day's hunt than I could find in Florida if I were to devote all my energies to collecting for the period of a year. Snakes of all kinds, alas for the degeneracy of our time, and assassinations committed daily by the ruthless automobile, are getting scarce.

A special reason I have for liking Florida is the fascination of her giant springs, scattered all over the State. Most wonderful among these is the mysterious Rock Spring in northwest Orange County, pouring out some forty thousand gallons of cool water every minute from a rocky cave under a cliff, and then spreading over the shallow white sands. In this water children may wade for a mile or two in safety. The surrounding natural park, too, undisfigured by buildings, is the most beautiful I have yet seen in the State.

One laments here and there the mania of the turpentine. Where, I ask, in our whole country is there a state as interesting as Florida to the naturalist?

My last and best reason for being drawn southward each year to Florida is that many dear friends are scattered throughout the State—any state's chief asset. The warm hearts,

the affectionate greetings and happy fellowships from Jacksonville to Miami, to Tampa, to Fort Myers and Bradenton, not omitting Moore Haven, Avon Park, Lakeland, Cocoa, Kissimmee and Orlando.

It seems invidious to thus specify names of places, for the quality of friendship is never strained, but is ever the same in all Florida's towns and counties. I must not close without mentioning the wonderful Atlantic and Gulf Coast lines, the islands with their bays and inlets, the mysterious Keys, the ubiquitous remains of the Indian Aborigines, and myriads of other things, which crowd memory—clamoring for recognition, or at least passing mention; but enough, it is easy to see why I love Florida.

FLORIDA GRADUATE JOINS

EXPERIMENT STATION STAFF

Bedsale M. R.
M. R. Bedsale, M.S.A. graduate from the University of Florida, will begin work at the Everglades Experiment Station at Belle Glade September 16, taking the place of E. R. Purvis, assistant chemist, resigned, according to the State Board of Control.

Farm children do not have to stay out of school to help carry on the farm work.

KETTER FARM FOREMAN EVERGLADES STATION

R. W. Ketter, graduate of the Michigan State College, began work at Belle Glade August 15 as farm foreman of the Everglades Experiment Station at Belle Glade.

Customer: How much do you earn a week, my boy?

Errand Boy: 'Bout three hundred dollars for the firm but I only gits twelve dollars of it.—Old Maid.



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Orlando, Florida



"Please Say You Saw It In The Citrus Industry"

Finds Small Cities Best Markets For Mixed Carloads of Produce

Small cities in the West, the Rocky Mountain region, and the South offer the most promising field for development of the mixed-car business in fruits and vegetables, according to a survey by the Bureau of Agricultural Economics of the U. S. Department of Agriculture. This is because there are relatively few large primary markets in these regions from which produce can be redistributed by motor truck.

Shipments of mixed cars have increased from 30,108 cars in 1922 to 49,275 cars in 1929. A larger increase might have been expected, say the marketing specialists, J. W. Park and Brice Edwards, who made the survey for the bureau, had it not been for the active competition of the motor-trucking of produce, whereby an increasing volume of supplies is redistributed from primary markets to smaller consuming centers within a radius of 200 miles.

Principal sources of mixed-car shipments are the Southern States, the Pacific Coast States, and some of the Middle Atlantic States. Figures for 1928 and 1929 indicate that more than 94 per cent of the mixed-car shipments originated in 13 States. In 1929, Florida led in volume of mixed-car shipments followed in order by California and Texas. Texas led in mixed vegetable shipments, Florida in mixed citrus fruit shipments, and California and Washington were the chief source of mixed deciduous fruit shipments. Some other important States shipping chiefly mixed vegetables were Colorado, Virginia, New Jersey, Louisiana, New York, and Mississippi.

The investigators found that some of the advantages claimed for mixed-car shipments are that they widen distribution by increasing direct shipments to the small markets where dealers do not have the volume of trade to handle straight carloads; that the small markets receive products in a fresher condition than when redistribution is made from large markets; that mixed-car shipments have an advantage over l. c. l. (less than carload lots) freight, express, or truck distribution under conditions making possible refrigeration in transit and lower cost of transportation; and that, under certain conditions, particularly at the beginning and end of a season and for certain commodities produced in small quantities, mixed-car shipments are con-

venient.

Some objections to the use of mixed-car shipments are that the cost of assembling and loading is frequently more than in the case of straight carloads; that it is sometimes difficult to load mixed cars to prevent shifting; and that some dealers claim the grade and pack in mixed cars are likely to be inferior to those in straight cars. It is believed that some combinations of fruits and vegetables are not adaptable to loading in mixed cars. The irregularity of supply and lack of business connections in shipping areas are objections to mixed-car business advanced by some dealers. The practice of dealers in some small markets of pooling receipts of straight cars operates against the development of the mixed-car business, it is believed.

Freight rates on mixed cars, the investigators declare, generally have been considered unfavorable to the development of the mixed-car business. In many cases the rate on a mixed-car shipment has been based

on the commodity which takes the highest rate and on the minimum carload weight of the commodity which
(Continued on page 25)



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Our experience is that Florida soils need organic fertilizers. Chaco Fertilizer is mostly organic. You can see the difference.

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Sanford, Florida

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These Synthetic Nitrogen fertilizers produce outstanding crop results. One grower writes that, commencing with two year old trees and putting on three applications of Nitrophoska in 18 months, his trees (now three and one-half years old) average up in every way with a well cared for grove of five year trees.

Another grower writes, "I consider them the most economical fertilizers I have ever used." And another writes of "the great saving in my fertilizer cost." Still another says "Comparison of costs and results shows an astonishing difference in favor of Synthetic Nitrogen fertilizers."

Our new booklet "**Better Crops at Lower Cost**" will tell you why Nitrophoska, Calcium Nitrate and Calurea produce better crops and how they save money and labor. Write for it today—just use the coupon below.

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- No. 1—15% Nitrogen (18.2% Ammonia), 30% Available Phosphoric Acid, 15% Potash.
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- No. 3—15½% Nitrogen (18.8% Ammonia), 15½% Available Phosphoric Acid, 19% Potash (Sulfate).
- No. 4—15% Nitrogen (18.2% Ammonia), 11% Available Phosphoric Acid, 26½% Potash.
- No. 5—10% Nitrogen (12.1% Ammonia), 20% Available Phosphoric Acid, 20% Potash.

JACKSON GRAIN COMPANY (Distributors)
Tampa, Florida, Dept. A.

Please send me a copy of your free booklet, "Better Crops at Lower Cost." This does not obligate me in any way.

I grow _____ acres of citrus _____ acres of truck crops.
Name _____
P.O. _____ County _____ State _____

"Please Say You Saw It In The Citrus Industry"

CITRUS COMMENTS

(Continued from page 14)

Undoubtedly we will find variations in seasonal readings due to natural causes. We know positively that the alkaline content or the acid content of the soil can be varied at will by fertilizers applied. Is a sharp variation desirable or should it be avoided? Fertilizer leaching and availability are tied in directly with the variation in soil acidity. Fertilizer conservation could easily be a factor in maintenance of a certain percentage of soil acidity.

A few of the grove examples given by Dr. Fudge offer some information along some of these lines. The Lake Alfred Station grove in particular (grove No. 11.) is interesting as to the effect of a very limited number of nitrogen sources. The variation in pH reading after a number of years as pointed out by Dr. Fudge are surprisingly slight.

We are losing more than we realize in this state by handicapping the Experiment Station in its ability to investigate citrus problems in the field. We should have more source blocks using other sources of nitrogen, we should have blocks deliberately built up to the neutral point and held there while being fertilized with the same schedule in use at present. As our state work now stands we are dependent on private ownerships for entirely too much of the state investigations. This is a serious handicap for the men engaged in it and means constant loss to the growers.

The fertilizing schedule in grove No. 11 does indicate one very important thing and that is that the fertilizer materials which can be purchased at lowest cost is likely to be a very satisfactory fertilizer and even where used continuously will not dangerously alter the soil acidity reading.

The second paper in this issue by our Experiment Station Chemist Dr. R. W. Ruprecht calls our attention to the work done by the station along several very important lines. It is a good progress report but it does not set out the value of the Lake Alfred Station as clearly as it should.

This paper should result in every grower in the state making a trip to the Lake Alfred Station. The fertilizing blocks there have progressed sufficiently far to make the trip well worth while. There is something to see and think about at the station. Dr. Ruprecht's paper deals with the work there in a very straight-forward manner and the two, the paper and the station trip, should be made together. Be sure to read both papers

THE CITRUS INDUSTRY

in this issue of "The Citrus Industry."

DESCRIBE REGULATIONS GOVERNING PLANT IM- PORTATIONS INTO MEXICO

A brief summary of the rules and regulations governing the importation of plants and plant materials into Mexico has been prepared by the Plant Quarantine and Control Administration, the branch of the U. S. Department of Agriculture which enforces similar laws in this country.

This is the second of a series of pamphlets summarizing the plant-quarantine laws of foreign nations, and will be followed shortly by similar publications dealing with the laws of other countries. The first dealt with Cuban regulations.

Special quarantine laws regulate the entry into Mexico of citrus trees, coffee, cotton and cottonseed, potatoes, rice, banana plants, wheat, sugar cane, and many fruits and vegetables. In every case these quarantine laws have been passed to prevent the introduction of some crop pest or disease into Mexico, says Lee A. Strong, chief of the Plant Quarantine and Control Administration. The only quarantine applying exclusively to the United States is that on account of phony peach, peach yellow, peach rosetta, and little peach diseases.

Copies of the new publication, PQ-CA-284, may be obtained by writing to the Plant Quarantine and Control Administration, U. S. Department of Agriculture, Washington, D. C.

Speaker (at dinner of club): Gentlemen, did you ever stop to think? I ask you again, did you ever stop to think?

Stewed (tired and sleepy): Did you ever think to stop?—Ga. Tech. Yellow Jacket.

"How about giving Jennie a bar pin for her birthday."

"My goodness no! She just joined

the Anti-Saloon League last week?" —Ohio State Sun Dial.

Caddie: "I can't caddie for you today, sir."

Mr. Bluster: "Why not?"

Caddie: "Well—er—I sold you to Johnny fer a nickel last night." — College Humor.

Pug: "What is usually done with the holes of doughnuts?"

Mug: "They're used to stuff macaroni." — Orange Peel.

"Is your new girl very bright?"

"Well, she thinks that since you play golf on the golf links, you must box on the cuff links." — College Humor.

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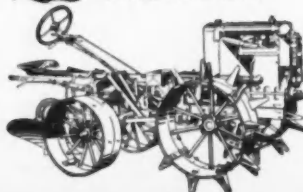
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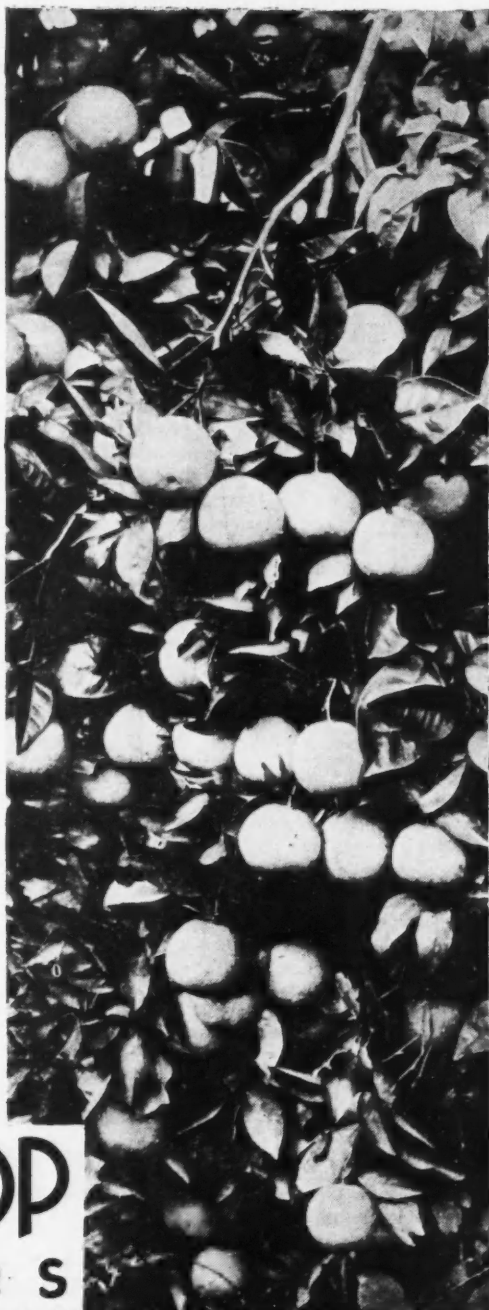
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Chinese Dwarf Lemon

By Roland McKee in U. S. Bulletin No. 946

In March of 1908, Frank M. Meyer, agricultural explorer of the Department of Agriculture, while traveling in the vicinity of Peking, China, observed a lemon that was used as a house plant and was regarded very highly by the Chinese. It was grown as an ornamental plant, but the fruit was also considered of excellent quality. Plants of this variety were obtained by Mr. Meyer and carried with him along with other plants on his return to the United States in June, 1908. This was given an "accession number," S. P. I. 23028, and determined as *Citrus limonia* Osbeck. It has since been questioned as to whether or not it may be of hybrid origin, but this is yet to be determined. The varietal name Meyer has been suggested for use in connection with this introduction. Mr. Meyer's note regarding this lemon was as follows:

(No. 690, March 31, 1908) From Fengtai, near Peking, Chihli, China. Ornamental lemon. This lemon is grown as a pot plant when dwarfed, and is very much appreciated by the Chinese higher classes as a decorative house plant in winter. At that season a small plant often has a dozen large lemons hanging on its branches and sometimes sells for \$10. Protect from frost. Can be slipped in sandy soil in flat pots. Chinese name "Hsien Yuang."

Mr. Meyer landed at San Francisco and took his plants to the department's plant introduction garden at Chico, Calif., in the Sacramento Valley. Here they were grown and propagated for testing in the various citrus areas of this country and for testing as a pot plant farther north. It has been observed at Chico that the plants can be propagated readily from cutting as Mr. Meyer indicated and that they are much more winter hardy than ordinary commercial lemons. It was not killed by a temperature of 13° F. at the Chico plant introduction garden, although the top was killed back severely. A temperature of 24° F. has done no other damage than to discolor some of the leaves.

This lemon is a dwarf-growing plant attaining under favorable circumstances a height of 8 to 10 feet. In general it is a low-growing, bushy plant requiring a space not over 8 feet square. The fruit is slightly larger than that of the Eureka, thin skin, and but little fiber or rag. It is very

juicy and mildly acid for a lemon.

Experience of American Growers

One experimenter in California in December, 1925, reported as follows:

The trees, while slow growing, appear to be harder than either the Lisbon or Eureka. Occupying the same situation in my orchard as these varieties, they (the Eureka and Lisbon) lost a few leaves during the extreme cold of a year ago, but the trees of Meyer lemon did not suffer any injury to either leaves or tender terminal growth. They fruited the

second year from planting and have proved very heavy bearers. The fruit has fewer seeds than either the Lisbon or Eureka, has a smooth, glove-like skin; the center of the fruit is entirely lacking in fibrous growth, carries considerably more juice than any lemon grown by me (I have seven varieties) and we prefer it to any for household use.

An experimenter in Florida reported in the spring of 1926 as follows:

During December of 1925 we had

BROGDEX INSURES

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Longer Keeping Time

Less Refrigeration Expense

Trade Preference

Any one of these advantages means a larger net return. Any one well justifies the 6c a box service charge for Brogdex. All of them mean many thousands of dollars earned and saved. These are statements of fact as well as matters of record.

So general is the belief that the Brogdex treatment is of very vital importance to the citrus industry that the state of Florida and the Clearing House Association are reported to have appropriated money to contest the Brogdex patents on the ground that they constitute a COMMON BENEFIT TO ALL.

Brogdex packers in Florida will ship this season over one-third of this year's crop, California about one-third and Texas 90%. There will be more Brogdexed fruit in terminal markets than ever before. Buyers will have even greater opportunity to make comparisons and take their choice.

A questionnaire recently sent out to the wholesale and retail fruit trade in New York, Boston, Philadelphia, Cincinnati, Detroit and Chicago shows almost a universal endorsement of Brogdex. Many of the buyers state that their trade DEMANDS Brogdexed fruit.

That being the case, Brogdex will be first choice and will rule the market.

The packing season is only a few weeks away. Brogdex can be quickly installed—probably in time for the opening if you act quickly. Wire or phone and a Brogdex man will see you.

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temperatures of 24°, 22° and 16° F. The plant was partly defoliated at 16° F., but suffered not at all from the other temperatures. All growth appears to be unhurt and we believe it will prove only slightly less hardy than the Satsuma.

The department has but little exact information regarding yield of fruit, but general observation and reports indicate it as producing well. An experimenter in California reported in December, 1925, as follows:

I planted my tree out-of-doors in the lawn five years ago. The second year after planting it produced 7 fruits, the third year 111 fruits, the fourth year 138 fruits, and this year 25. In 1924 it overproduced and then the frost killed most of the leaves, resulting in a lighter crop this year (1925).

At Brownville, Tex., a tree 6 feet high bore 132 lemons in 1920 and 240 in 1921; these averaged 8 ounces in weight. At Irvington, Ala., a tree planted in 1918 was reported to have borne several hundred fruits in 1921 and about 1,000 fruits in 1923. However, that same tree died during the cold winter of 1923-24.

FINDS SMALL CITIES

BEST MARKETS FOR MIXED CARLOADS OF PRODUCE (Continued from page 20)

takes the highest minimum weight. Some adjustments in freight rates have been made in recent years to correct this situation.

Mixed-car shipments to the large primary markets, it is pointed out, are largely on consignment and are made at the convenience of the shipper, whereas mixed-car shipments to the smaller markets are sold largely on order and are made up in accordance with the requirements of the purchaser. Dealers in the large markets in general look with disfavor on mixed-car shipments. Redistribution from the large primary markets by motor truck and in mixed cars has curtailed the more rapid development of direct mixed-car shipments from producing areas, and shipments of mixed cars from the large markets to points in their trade territories have decreased in recent years. Freight rates in some instances have been unfavorable to mixed-car redistribution.

Dealers in small cities up to 100 miles or even 200 miles from large primary markets often prefer to buy in those markets rather than to buy direct from producing areas, the survey showed. The dealers assert that the possible advantage of direct shipments because of cheaper transportation and better condition of commodities is offset by other factors.

Will you spend a Dime to make a DOLLAR?

THAT'S all it costs—or even less—to put a citrus tree in tip-top, money-making condition. And now's the time to spend the dime.

Don't let your trees lag. The supply of available nitrogen in the soil has been drained in producing the heavy crop now on the trees. Don't take chances on the returns in sight.

Every dime invested in Chilean *now* to replace the used up nitrogen, means a dollar in your pocket later on.

Two to five pounds of Chilean Nitrate per tree in bearing groves, will insure good size, fine quality, and better price for a crop.

See your fertilizer dealer. He can supply your Chilean at a rock bottom price.

IMPORTANT—to protect yourself and to protect your dealer, don't just order "nitrate". Specify "**CHILEAN NITRATE**" and no so-called substitute can be delivered to you.

CHILEAN NITRATE is the natural product, not synthetic or artificial. In addition to its quick-acting nitrogen, it contains such rare elements as boron, iodine and magnesium, all of which play their own important part in promoting plant growth and health.

If your dealer can't supply **CHILEAN**, or if you want any special fertilizer information, write us.

1830-1930—Chilean Nitrate is completing its 100th year of profitable service to the American farmer.

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Orlando Bank
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Orlando,
Florida

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"Please Say You Saw It In The Citrus Industry"

Refrigeration Charges On Fruits and Vegetables From Florida

Word has just been received from C. R. Marshall, Counsel, and J. Curtis Robinson, Executive Vice President of the Growers and Shippers League of Florida, that Director W. P. Bartel and Examiner John L. Rogers of the Interstate Commerce Commission recently released their tentative report in the further hearing in the South-eastern Refrigeration Investigation, Docket 17936. The further hearing was held at the request of the Carriers to give further consideration to the elements of profit and cost of haulage of ice in bunkers of refrigerator cars, which are factors of the refrigeration charges for which the carriers contended sufficient allowance had not been made in the original decision of the Commission.

Mr. Marshall advises that the proposed report affirms the findings and conclusions of the Commission in its earlier reports. It finds that the carriers have wholly failed to sustain their criticisms and exceptions to the Commission's original Report in reference to which the Commission granted the further hearing, and indicates that on the contrary the allowances made by the Commission in its original report for certain factors of cost were sufficiently generous.

This means that if the Commission approves the Report of Director Bartel and Examiner Rogers the reductions in the Refrigeration Rate on citrus fruits, vegetables, melons and berries from Florida to eastern destinations which have been in effect since May 1929 upon basis of the Commission's original finding will be made permanent and insure to Florida shippers a saving of several hundred thousands of dollars annually on normal movement.

SEARCH FOR FRUIT FLY IN FLORIDA

Covering Florida in an intensive search for any evidence of the presence or activity of the Mediterranean fruit fly, about 600 inspectors are working under the direction of the Plant Quarantine and Control Administration, U. S. Department of Agriculture. In the first twenty-one days of August, says Lee A. Strong, chief of the administration, these inspectors sent to the Orlando, Fla., office of the organization, 140,579 larvae which they had found in the

course of their work. Experts at the Orlando office examined these and found that none of them was a Mediterranean fruit fly larva.

The number of the larvae and the variety of the host fruit and vegetables from which they were taken, says Mr. Strong, indicate the intensity and the efficiency of the search for the fruit fly in Florida. Inspectors found larvae in avocados, guavas, peppers, oranges, grapefruit, tomatoes, sour oranges, cacti, peaches, figs, plums, pomegranates, pears, grapes, wild plums, wild grapes, ground cherries, lemons, eggplants, persimmons (wild and Japanese), pawpaws, tangerines, papayas, olives, mangos, mushrooms, palm fruits, custard apples, limes, maypops, ba-

nanas, almonds, quinces, love apples, Surinam cherries, sapotas, and cantaloupes.

FORMER AGRONOMY HEAD WITH EVERGLADES STATION

Dr. A. Danne, former head of the Agronomy department at the Oklahoma Experiment Station began work as Associate Agronomist at the Everglades Experiment Station at Belle Glade September 1. He resigned the Oklahoma position to go to the University of Minnesota and complete his Ph.D. degree. He finished in June, and was appointed at the last meeting of the Florida State Board of Control.

PINEAPPLE SLIPS ORDERED

Another order of 2,000 pineapple slips was recently sent to Porto Rico by eight Saint Lucie County growers, Alfred Warren, county agent, reported. The slips are expected to arrive near the middle of August.

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Rooms - Baths
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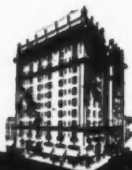
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"Please Say You Saw It In The Citrus Industry"

GUMMOSIS AND PSOROSIS OF CITRUS TREES

(Continued from page 10)

involved and enough of the bark may be killed to girdle the tree. In such case band-like lesions are formed which may vary from a few inches on the smaller branches to a foot or more on the trunks. Psorosis may occur on the smaller branches as well as on the trunks and older limbs while gummosis is usually confined to the trunks and larger limbs. Gummosis occurs on lemon, grapefruit and orange, ranking in severity in the order named. The sour orange appears to be very resistant to both gummosis and psorosis. In Florida psorosis attacks tangerine, orange and grapefruit. Psorosis or scaly bark then, may be briefly characterized by dry scaling off of bark without much gum formation, whereas, gummosis is characterized by a pronounced exudation of gum.

Treatment of Gummosis and Psorosis

The treatment of gummosis and psorosis is essentially the same. The principle involved consists of the elimination of the diseased tissue without interfering with the production of new healthy bark from the cambium or growing area. The diseased portion is scraped off to a moderate depth over the affected area and also well in advance of it. The scraping in advance of the lesion can be done more lightly. All discolored portions should be removed. Dead bark should be carefully cut out down to the wood if necessary. This is not always essential with very small discolored areas since the dead bark will eventually be sloughed off after the scraping by the formation of new callous bark tissue. The scraped areas should be painted with some good disinfectant which may assist in preventing further spread of the disease but most important of all will prevent the entrance of other organisms into the wound.

There is often a flow of gum following the treatment, and this, together with shedding of portions of the outer bark, may give the appearance that the treatment has not been effective. Gummosis and psorosis do not yield to haphazard methods of treatment and many growers consider it useless to attempt to control them. The gum that exudes following the treatment is already formed underneath the bark in the outer wood tissue and will naturally run out as cracks occur in the bark. The success of the treatment can be determined only by periodic inspections at intervals of three to six months following the first treatment. In case the bark was not scraped sufficiently

far in advance of the diseased area to check its development, or if new infections have appeared in adjoining areas, another treatment should be given. Gummosis is likely to break out in a short time, especially during the spring or summer, some distance from what appeared to be the limit of the disease at the time of the treatment. Gummosis and psorosis cannot be cured in every case by the first treatment especially if the bark is not scraped at least four to six inches in advance of the infected area. Considerable difference appears to exist in the shedding of the bark from the diseased area following treatment with different fungicides. Of the various disinfectants tested the lime-sulphur compounds appear

to be most effective in stimulating scaling of the bark while paints or other thick preparations seal up the bark and retard the process.

In California some injury has resulted from the use of lime-sulphur paste in the sections near the coast where a combination of high temperature and high humidity is encountered. This injury is explained on the basis that the heat volatilizes the polysulphides in lime-sulphur, forming a gas, sulphur dioxide, which in turn unites with moisture to form sulphurous or sulphuric acid. Either of these substances are injurious to bark and if present in any quantity will kill the wood. There is little or no danger from the lime-sulphur com-

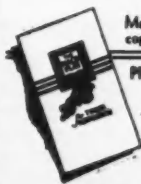
(Continued on page 34)

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"Please Say You Saw It In The Citrus Industry"

Culture of Citrus Fruits In The Gulf States

By E. D. Vosbury, Formerly Scientific Assistant, Office of Horticulture, and T. Ralph Robinson, Physiologist, Office of Horticultural Crops and Diseases, Bureau of Plant Industry

(Reprinted from Farmer's Bulletin No. 1343 U. S. Dept. of Agriculture)

(Continued from last issue) affected by a number of insect and
 Spraying (6) disease pests. Most of these can be
 Citrus trees in the Gulf States are controlled or eliminated by proper

nized by most successful growers as essential to the profitable production of high-class bright fruit as well as for the growing of healthy, vigorous trees.

Table 4.—Spray Schedules for Grapefruit and Orange Trees (1)
 GRAPEFRUIT

Appli- cation	Time of Appli- cation	Material	Enemies	Remarks
A	About Mar. 15 to Mar. 25. 2 or	3-3-50 Bordeaux mixture plus 0.5 per cent oil as emulsion.	Scab, early mel- nose, scale crawl- ers, and white fly.	Only partially effective against severe scab outbreaks. ³ This is a good time to spray if grower can make but one application for scab control.
A	About Mar. 15 to Mar. 25. 2	Lime-sulphur solu- tion, 2 ½ to 3 gal- lons to 100 gal- lons, or sulphur dust.	Scab, red spiders, rust mites, and scale crawlers.	Has but moderate ef- fect against scab, but is desirable for its ef- fect against insect pests.
B	Apr. 5 to Apr. 15	Lime-sulphur solu- tion, 1 ½ to 2 gal- lons, or sulphur dust.	Rust mites, shark skin, tear stain, and scale crawl- ers.	Probably not necessary if lime-sulphur is used in application A.
C	Apr. 25 to May 5. 4	3-3-50 Bordeaux mixture plus 1 per cent oil as emulsion.	Melanose, white fly, and scale insects.	Usually quite effective against melanose. ⁵
D	June 10 to June 15	1 per cent oil as emulsion. Lime- sulphur solution or sulphur dust.	Rust mites and scales.	Very important if cop- per sprays have been applied during the season.
E	Sept. 1 to Oct. 31	1 per cent oil as emulsion. If rust mites are abun- dant, lime-sulphur solution or sul- phur dust.	Scale insects, white fly, sooty mold, and rust mites.	Not always necessary. ⁶

ORANGE

A	Apr. 20 to May 5	3-3-50 Bordeaux mixture plus 1 per cent oil as emulsion.	Melanose, white fly, and scale in- sects.	Usually quite effective against melanose. ⁵ Probably not neces- sary on rather young trees where these enemies do not occur. The critical rust-mite application.
B	June 1 to June 15	Lime-sulphur solu- tion 1 ½ to 2 gal- lons to 100 gal- lons, or sulphur dust.	Rust mites, tear stain, shark skin, and scale crawl- ers.	
C	June 25 to July 5	Oil 1 per cent as emulsion.	Scale insects	Very important if ap- plication A was ap- plied.
D	Sept. 1 to Feb. 1	Oil 1 per cent as emulsion. If rust mites are abun- dant, lime-sulphur solution or sul- phur dust.	Scale insects, white fly, sooty mold, and rust mites.	Not always necessary. ⁶

(1) These spray schedules should be expected to give reasonably satisfactory results under the conditions in Florida in years when the diseases and insect pests do not occur in unusual abundance.

(2) In the last of the bloom, when about three-fourths of the petals have fallen.

(3) Under very severe scab conditions a second application of Bordeaux oil may be required within 2 or 3 weeks.

(4) At least 10 days should elapse between the lime-sulphur and Bordeaux-oil applica-
 tions to avoid danger of injury.

(5) For more information on melanose control, see the following publication:

Winston, J. R., and Bowman, J. J. Commercial Control of Citrus Melanose. U. S. Dept.
 Agr. Circ. 259, 8 p. 1923.

(6) For detailed information on the control of Florida citrus insects, see the following
 publications: Yothers, W. W. Spraying for the Control of Insects and Mites Attacking Citrus
 Trees in Florida. U. S. Dept. Agr. Farmers' Bul. 933, 39 p., illus. 1918.

For more complete information on scab control where the disease occurs in quantity, see
 the following publications: Winston, J. R. Citrus Scab: Its Cause and Control. U. S. Dept.
 Agr. Bul. 1115, 39 p., illus. 1923.—Commercial Control of Citrus Scab. U. S. Dept. Agr.
 Circ. 215, 8 p. 1922.—Bowman, J. J., and Yothers, W. W. Bordeaux-Oil Emulsion. U. S.
 Dept. Agr. Bul. 1178, 24 p., illus. 1923.

Yothers, W. W., and Winston, J. R. Mixing Emulsified Mineral Lubricating Oils With
 Deep Well Waters and Lime-Sulphur Solutions. U. S. Dept. Agr. Bul. 1217, 6 p. 1924.

⁶ The information in this section was con-
 tributed by H. R. Fulton, of the Bureau of
 Plant Industry, and W. W. Yothers, of the
 Bureau of Entomology.

grove sanitation, pruning, and spray-
 ing. Spraying or dusting is now recog-

The spray schedules shown in
 Table 4 for grapefruit and orange
 trees are believed to represent the
 average number of applications that
 will prove effective in average years
 for the commercial control of fun-
 gous and insect pests.

Further information concerning the
 nature and control of citrus diseases
 and insect pests in Florida and the
 other Gulf States may be obtained
 by writing to the United States De-
 partment of Agriculture, Washing-
 ton, D. C., or to the appropriate
 State Agricultural Experiment Sta-
 tion.

Rejuvenation of Old Groves

Many of the older citrus groves in
 the Gulf States are no longer bearing
 as profitable crops as they did in
 former years. In many groves this de-
 terioration, usually due to neglect, is
 very noticeable.

Where old trees are in very bad
 condition, especially when they are
 affected with foot rot, it is usually
 best to grub them out and make a
 fresh start with young trees of stand-
 ard budded varieties. If the trunks are
 in sound condition, however, a thoro
 pruning, followed by cultivation, fer-
 tilization, spraying, and general good
 orchard management, will often bring
 run-down trees into profitable bear-
 ing in two or three seasons, provided
 there is no inherent fault in the soil
 or the locality.

In the case of groves that become
 crowded with age or from too close
 planting, it is often of advantage to
 remove alternate rows. The trees tak-
 en out, if healthy, can be profitably
 reset in new ground. In two or three
 years such trees should be bearing
 profitable crops. The work is best
 done in the winter when the trees are
 dormant. It is important that a large
 basin be made around the newly set
 tree capable of holding a half barrel
 or more of water, and water should
 be supplied in abundance. The main
 roots should be cleanly cut 2 or 3
 feet from the tree trunk and handled
 without bruising. Soil should be very

carefully packed around the roots in resetting. The tree trunks and main limbs should be whitewashed or wrapped with burlap as a protection against sun scald.

There are also many old groves, consisting of seedling or inferior budded trees, that might be very profitably budded or grafted over to standard varieties. Where the work is done carefully, such undesirable sorts can often be worked over within a few years into bearing trees of Pineapple, Valencia, and other standard varieties, worth far more than the original trees.

In top working undesirable trees of this sort two or three main limbs should be selected as the foundation for a new top. Additional limbs should be budded later, after the first buds have made a good start. The buds may be inserted directly into the bark of the limb itself at any season of the year when the tree is growing vigorously. Two or more buds are inserted at the base of each limb, and after these have made a good growth the old limb should be lopped off close to the new bud sprout. Grafting with the aid of paraffin by means of the Morris "slot-graft" method makes possible the insertion of grafts into old thick bark without sacrificing the top until the new graft has taken. Another method of budding large limbs is to cut them back to stubs a foot or so in length. Sprouts will soon start from these stubs and after the sprouts are half an inch or more in diameter two or three buds may be inserted in each of them. One or two of these buds are permitted to develop at the base of each limb, and others are eventually removed.

Mature trees may also be worked by the methods explained in connection with the treatment of frost-injured trees.

Old orange trees on sweet-orange stocks are often badly affected with foot rot. Such trees should be grubbed out and replaced with new trees on sour-orange or other resistant stocks. When foot rot has not advanced too far, however, it is possible to save the affected tree by planting small resistant seedlings in the ground near the base and inarching the tops of these seedlings into the trunk of the large tree.

Incipient cases of foot rot will often yield to treatment with Bordeaux paste or lime-sulphur concentrate after thorough cleaning of the bark wounds.

Treatment of Frost Injured Trees

Trees that have been injured by cold often require severe pruning. Two or three weeks after the freeze

the extent of the damage will be apparent, and the trees should then be cut back to sound, healthy wood. Cuts should be made clean and close to the growing limb or sprout whenever possible. The limbs or trunks when exposed should be whitewashed, wrapped with burlap to protect them from the sun. After this pruning the injured tree should be carefully cultivated and fertilized, so that the most favorable conditions for the rapid recovery of the grove are afforded.

When the bark is badly split on the trunks and limbs as a result of frost the loosened bark may be tacked down and tied in place with raffia or cord. When there is still some live adherent bark this treatment has given good results when performed immediately after the injury occurred, before the bark had time to dry out. Painting the trunk with grafting wax or similar material is seldom beneficial, and may result in actual injury when the area so covered is large.

Citrus trees when not banked or mounded are sometimes so badly injured by frost that it becomes necessary to cut them off at the surface of the ground below the bud. In that event the sprouts that start from the old stump may be shield grafted in the same manner as seedling stock. Some growers prefer to crown graft. This is done by first cutting the old stumps back to clean live wood an inch or so above the ground; two or more scions of the desired standard variety are then inserted between the bark and the wood, and the stump is banked with moist soil until the tops of the scions are entirely covered. If the scions fail to take, the sprouts that will start from the stump may be budded. Crown grafting is best performed when the trees are dormant in the winter or fall, while sprout budding may be done at any season of the year when the bark slips readily.

Where badly injured trees are budded or grafted by one of these methods, buds of the best named varieties should be used. In many cases seedling trees after a freeze have been budded to standard varieties, with the result that within a few seasons the reworked trees were more valuable than before the freeze.

Harvesting and Marketing Citrus Fruits

The harvesting and marketing of citrus fruits is usually done by the fruit buyer or by one of the various cooperative associations rather than by the grower himself. The grower, however, should either supervise the operations in his grove and in the packing house or satisfy

himself that the work is in competent hands, in order to insure that his crop may be handled in such a way that it can be marketed in the best possible condition.

Too much emphasis cannot be placed on the necessity for care in the methods of handling citrus fruits at all stages. It has been shown in the course of investigations conducted in the Gulf States by the United States Department of Agriculture that much of the decay developing in citrus fruits prior to their arrival on the market is due to improper or careless methods of picking, packing, and shipping.

In clipping the fruit from the trees some style clipper should be used that will not puncture the fruit. Picking boxes should be kept clean and free from projecting nails or splinters and gravel. The packing house machinery should be thoroughly inspected and adjusted so that the fruit is handled with the greatest possible care. Punctures and bruises resulting from neglect of these precautions are responsible for a large proportion of the cases of fruit decay.

The loss from mechanical injuries can be in a large measure traced to the piecework system of picking and packing, i. e., payment by the box. The obvious remedy is a change to properly supervised labor paid by the day.

(Continued next issue)

SIX YEARS PROVES CROTALARIA BEST HIGHLANDS GROWER

A saving of from one-third to one-half the cost of fertilizing his citrus grove has been effected by the use of crotalaria as a summer crop, Earl W. Hartt, Avon Park grower, stated during Farmers' Week.

He is one of the pioneers in the cover crops field, having used crotalaria in his groves in Highlands County for the past six years. The high nitrogen content of crotalaria allows him to greatly reduce the nitrogen added from commercial fertilizer. Furthermore, he said, the nitrogen was in the organic form, whereas the nitrogen applied as fertilizers is in an inorganic state.

He said that the large quantity of vegetation produced by crotalaria served to build up the body of his soil, increasing its moisture holding capacity, and reducing the loss of plant food through leaching.

Any possibility of damage from the pumpkin bug can be avoided by mowing the cover crop before the formation of seed pods, the part of the plant upon which the bug feeds, he said.

IMPRESSIONS

By The Impressionist

Progressive K. C. Moore, county agent for Orange County, recently led a motorcade of citrus growers of that county down to the branch citrus experiment station at Lake Alfred to see what was going on. Those participating reported it a pleasant and profitable day.

Personally we like to see the reactions of a grower of one section of the citrus belt looking over the groves in another portion. Recently we took Sol Wittenstein, the well known Orlando citrus grower, along as ballast in a day's rambling in Polk County. Sol has a fifty acre grove, and in addition runs about five hundred acres in Orange County for other owners. He pretty well knows his stuff; and his reactions were interesting to us.

By the bye, Sol Wittenstein claims never to have missed reading thoroughly every issue of THE CITRUS INDUSTRY since its early beginnings eleven years ago. For our part we believe him. Now and then he embarrasses us by referring to detailed portions of some article or item which we had neglected to read carefully. When he reads this, however, it will be his first knowledge of the fact. We have always bluffed it out.

A list of air-minded citrus men is beyond us, but we would put down off-hand "Doc." Adams of Auburndale, Ed Cornell of Winter Haven, B. C. Skinner of Dunedin, Clay Binion of Orlando and Wynn W. Scott of Haines City. George Haldeman of Lakeland, of course, has long rated in the professional airman class. Ruth Elder got her "flying start" at Lakeland, too, but rather classes as a by-product, so to speak.

Col. W. M. (Bill) Glenn, Orlando publisher and grove owner, once flew from Paris to London by plane, as a passenger, but it is our impression that the trip cured him of air-mindedness.

Back in the first week in June we became committed as party to some experiments in "quick-freezing" Florida oranges during next season. They

are to be made in Walter B. Ballard's fish freezing plant at Key West; and promise to be interesting to say the least. Slow freezing of fish by the old methods would not work. The cells burst and the product was sloppy when thawed out. Quick freezing at forty below zero, Fahrenheit, however, is proving a great success with fish. They thaw out just as if freshly caught.

We have a hunch that quick freezing will work on oranges, more particularly so since recent reports from Georgia indicates some success in using the process with peaches there this season.

It's our notion that by-products research in citrus now may well be focussed upon oranges. Grapefruit is certainly in a strong position and promises to be so for some years to come, due to by-products developments.

Now that all have read of the new Del Monte plant for canning grapefruit in Florida, and considering other grapefruit canning developments, we may modestly say, "we told you so." Blushingly we point to the fact that we have all along been a bull on grapefruit, and grapefruit canning.

It is now something more than six years ago that we took out time to traipse around over the citrus areas with the first scout sent to Florida by the Del Monte crowd. For a long time it looked as if nothing was going to happen; then all at once it just occurred.

We are entirely confident that Florida grapefruit growers are going to be assured quite satisfactory prices for canning fruit from now on. Yet we doubt if next season will set any mark, for there is too much scab prevalent, due to the heavy Spring rains. That may produce an excess of canning grade grapefruit, but it should be for only the one season.

For four generations Florida citrus growers have fought the inroads of maiden cane in their groves. Yet we have for quite a while nursed a sneaking notion, and a recent talk

with R. O. Philpot the well known Haines City grower has ripened it into a conviction, that this same obnoxious maiden cane is in reality the one best pasture grass which Florida possesses. We'd like to see the State Experiment Station get busy with a complete investigation of maiden cane's possibilities for pasturage.

Quite numerous compliments for the series of advertisements which the Florida Citrus Machinery Co. is running on the front covers. It pays one to take his advertising seriously and put care into its preparation, as B. C. Skinner long ago found out; and in G. L. Beardsley the company has a real advertising man as advertising manager.

A. R. Sandlin, now salesmanager of the Texas Citrus Fruit Growers Exchange, headquarters at Mission in the Rio Grande Valley, back in Florida in August for a visit to his former home in Leesburg, and to catch up on his fishing. Looking good, and feeling optimistic, and greeting flocks of his old friends and acquaintances.

Of particular interest the experience of a brand new grower of citrus in one of the inland counties. He bought a nice grove and, knowing nothing about growing anything, implicitly followed the directions given him by one of the well known pest control experts who lives nearby and whom he had early met. The result, as we saw it recently, is about twelve thousand boxes of full size, smooth skinned fruit, which as far as one can tell at this time might rank with Indian River fruit; and marketing representatives buzzing round like bees. It only strengthens our impression that when the growers of some sections shift their ideal from quantity to quality there will be no marketing difficulties.

The Orlando Citrus Growers Assn. of the Exchange packed quite a lot of grapes during the summer, earning revenues during an otherwise idle time. However, the statement that it "packed out the first full carload of grapes ever shipped from Orange County," which appears in one per-

(Continued on next page)

Cultivate Citrus Less, Says Speaker at Farmers' Week

"Today our cultivation cost is, comparatively, one of the smallest costs in grove operations," G. Albert DeVane, manager of 640 acres for the Lake Placid Land Company, stated in a Farmers' Week radio address over WRUF. He told how that up until three years ago he cultivated day and night during dry spells to conserve moisture, only to find that he was helping to deplete the soil of moisture. He explained how that excessive cultivation broke down organic matter rapidly, finally depleting the soil, resulting in many trees going into an ammoniated or die-back condition.

After much experience and observation Mr. DeVane stated that he has finally come down to a system of cover crops and less cultivation. Last August he mowed his Crotalaria about 9 inches high so as to control the pumpkin bug. In November the trees were fertilized, and the cover crop disked down just enough to prevent a fire menace. About 50 percent of the cover crop was left on top of the ground. The next cultivation was given when the fertilizer was applied in January. Crotalaria

was sown during late February and early March, and no further cultivation has been given. The May application of fertilizer was distributed over the ground, but not cultivated in. On July 10 the Crotalaria was mowed. It is being mowed again about the middle of August, and again in November at fertilizing time. During the last year the orchard was given two hoeings at a cost of about 6 cents per tree, he added.

When the grove is cultivated less a much heavier cover crop growth is obtained during the first part of the rainy season, and a large increase in organic nitrogen is the result. Fertilization cost the Lake Placid groves about 58 percent of the total cost, but by decreasing cultivation and adding cover crops the fertilizer cost some years is reduced by at least half.

When we practice less cultivation and more Crotalaria we get a hardened spring growth before much damage by the aphid, and we get more ideal conditions for fungi which reduced our cost of controlling rust mites and scale, he said.

IMPRESSIONS

(Continued from preceding page)
iodical, is rather far fetched. At the risk of being classed with Noah when he laughed at the "hero of the Johnstown flood" upon the latter's arrival in heaven, we will hazard the statement that we, and a lot of other old timers, can remember when years ago what is now the Dubsread golf course near Orlando was a great vineyard with a private railroad siding, and shipping grapes in carloads. This grape stuff isn't so new to Florida, though today we are working with new and improved varieties.

With the final sale of its remaining assets to the Exchange for \$62,000, the Florida United Growers has passed out of the picture. Not that it ever took up much space. With all its ballyhoo and press agending, and the pressure of big interests, it was able only to reach a seasonal grand total of 135,000 boxes from all its packing houses, or, as we once before pointed out, a little less than half the pack of the single Plymouth Citrus Growers Association of the Exchange during the same season.

With the passing of Josiah Varn of

Bradenton the Exchange has lost a wheel horse. One of the original party of fifty Florida growers which was responsible for launching the Florida Citrus Exchange, he gave to the organization long and loyal support; and gave freely of his time to its affairs.

If we may be so bold as to correct the Exchange's official chronicler, the late Josiah Varn was not a member of the Exchange board of directors "continuously until one year ago." There was a period of several years during which Mr. Varn was off the board and the Manatee Sub-Exchange was represented by the late J. W. Ponder of Sarasota.

SEPTEMBER CITRUS SUGGESTIONS GIVEN BY COLLEGE WORKER

Mow cover crops in time to beat the pumpkin bug, watch for whiteflies so that they can be presented early with a fall coat of oil emulsion, and give a little nitrogen to those trees that look hungry and yellow, are timely grove suggestions given by E. F. DeBusk, extension citrus

"Please Say You Saw It In The Citrus Industry"

pathologist-entomologist.

Due to lack of rain Crotalaria, generally speaking, will bloom a little later this season. As soon as it blooms it may serve as food for the pumpkin bug. A close watch should be kept, and, possibly during the first of September, the crop should be mowed 6 to 8 inches above the ground and allowed to let lie on the surface. Beggarweed and cowpeas should be cut below the lower leaves.

Growers should keep a close watch for whitefly larvae on the foliage, and for the sooty mold covering they may cause. The recommended whitefly remedy is a spray of 1 to 60 oil emulsion.

He also suggested giving those trees that look yellow or hungry a little nitrogen, simply scattered around the tree and allowed to go into the ground. He did not recommend any cultivation until the general fertilizer is disced in about November.

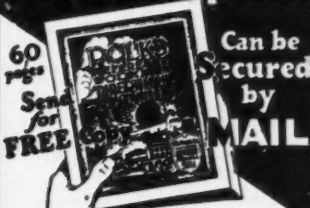
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The Coloring of Citrus Fruit In Relation to Decay

By Arthur S. Rhoads, Associate Plant Pathologist. Address Delivered Over State Radio Station WRUF at Gainesville, on September 4

The season of the year is at hand when packing houses are ready to artificially color citrus fruits for the early market. With the opening of the present fruit-shipping season, many of the packing houses will have completed the installation of new and improved equipment for the coloring of fruit, based upon the extensive experiments that have been conducted by specialists of the Federal government and the Florida Citrus Exchange. The improvements in coloring practice and the interest manifested by fruit-shipping associations indicate that an exceptionally efficient job of coloring will be done this season.

One of the promising features of the new coloring method is that it can be used for fruit sterilization if the need arises. Under the improved coloring methods recently worked out, the air condition desired, includ-

ing the introduction of gas, is accomplished in the conditioning chamber where the desired temperature, humidity and gas content are established. The conditioned air is then circulated by means of a fan into the top of the fruit room, down over the fruit, under a floor of the type designed for sterilization, and back into the conditioning room. The air is maintained fresh by the introduction constantly of a small quantity of fresh air instead of airing the room periodically as was done under the old practice.

The artificial coloring of fruit has been practiced for several years but the lack of definite authoritative experience and standard methods produced a variety of results which proved highly unsatisfactory. While further research work will be required to perfect the process, enough has been accomplished to outline a program which will serve as a guide during

the present season, especially in pointing out certain things that should not be done. The fruit coloring process is far from being fool-proof and requires considerable judgment and discretion upon the part of the operator.

In the first place, extreme care should be exercised both in the selection of the fruit to be artificially colored and in the manner in which the coloring process is carried out, since it has its limitations. Although the artificial coloring of fruit has an established place in the Florida citrus industry, it should be used as an aid in finishing the natural coloring process rather than as a means of forcing a color on immature fruit. To attempt the latter, as has been the tendency of many years past, is but to court trouble, since immature green fruit is difficult to color and liable to develop more injury and decay than

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mature fruit. Before the fruit is subjected to the coloring process it should show some evidence of the breaking of the green color. Rind blemishes, injuries and patches of scale insects cause marked difference in colorability. Fruit to be colored should not be picked when wet and should be picked and transported to the packing house with extreme care to prevent bruising of the rind, which results in the development of a green to greenish-brown spotting of the injured portions of the rind during the coloring process. Fruits with such blemishes are particularly subject to developing blue or green mold decay in transit. Fruit that has been sprayed with oil emulsion shortly before it is picked is not colored readily by the gas, since the oily film retards respiration, or gas exchange, in the fruit.

Where ethylene gas is used, the dosage of gas and the ventilation of the coloring room are especially important. Only the standard dosage of 1 cubic foot of the gas to 1,000 cubic feet of room space should be used every six or eight hours in charging the rooms. The fruit should not be crowded in the coloring room; a space of at least four inches should be allowed between each tier of boxes. Unless provision is made for constantly introducing a small quantity of fresh air, as under the recently devised "trickle system" of coloring, the rooms should be thoroughly ventilated for from a half hour to an hour before gassing, taking care to completely change the air. Poor ventilation not only retards coloring but, in combination with high temperatures and an excess of gas, may result in a surface pitting of the fruit and an increase in decay. Excessive doses of ethylene gas also retard coloring and may lead to rapid decay. Control of the temperature and humidity is also extremely important. Too high a temperature is likely to injure the fruit, while too low a temperature will unduly prolong the coloring process. The temperature should be kept within the limits of 80° to 85° F. The quicker the temperature is raised to this point the more rapid will be the coloring. A uniform temperature will give the most satisfactory results. The relative humidity should run about 80-85 per cent.

The fruit should not remain in the coloring room longer than 72 hours. If it does not color within this period it is too green even though it may pass the acid test. After the fruit has been colored, it is a good practice to precool it as quickly as possible in order to retard the develop-

THE CITRUS INDUSTRY

ment of decay while enroute to market.

FARMERS' WEEK SHOWS INCREASED ATTENDANCE (Continued from page 9)

tion at a time, since they were interested in many of the programs.

Practically every phase of the citrus industry, from fertilizing through grove management, diseases and insects, cover crops, drainage and irrigation, and marketing, was covered during the week's program of the

Thirty-three

citrus section. In addition, small fruits and tung-oil were discussed in this section also.

A. W. McKay, chief of the Division of Cooperative Marketing, discussed the Federal Farm Board and its work before a general session of all visitors, on Friday, August 15.

Mother: "Why, Willie, you shouldn't be afried of the dark."

Willie: "Aw, Ma, I can't help it. It gets in my eyes and I can't see anything." — College Humor.

State experience, references, salary expected, etc. to Box 1537, Orlando, Florida.

MISCELLANEOUS

RAISE PIGEONS—Profit and pleasure. Illustrated descriptive catalogue postage six cents. Vrana Farms, Box 314a, Clayton, Missouri.

TUNG OIL TREES—Cluster variety. Vigorous. Forty cents each. Lots of hundred 50 cents each. Hunt Bros., Inc., Lake Wales, Fla.

FOR SALE: Splendid bearing citrus grove in Lee County, far removed from Fruit Fly infestation. Will produce 20,000 boxes coming season. If you want this grove address P. O. Box 295, Fort Myers, Fla.

ORANGE PACKERS ATTENTION: — Two chemical transparent flexible orange coating processes for sale; royalty or license basis. Patent pending. Dr. C. V. Berry, 251 West 111th Street, New York City.

PUREBRED PULLETS FOR SALE—White Leghorns and Anconas ready to ship. Barred Rocks and R. I. Reds shortly. Several hundred yearling White Leghorns hens now laying 70%. Write or wire for prices. C. A. Norman, Dr. 1440, Knoxville, Tenn.

HIGH BLOOD PRESSURE easily, inexpensively overcome, without drugs. Send address. Dr. J. B. Stokes, Mohawk, Fla.

LAREDO SOY BEANS, considered free from nematode, excellent for hay and soil improvement. Write the Baldwin County Seed Growers Association, Lexley, Alabama, for prices.

AVOCADOS - SEED — Grafted. Reliable bearers only. John B. Beach, West Palm Beach, Florida.

WANTED—To hear from owner of land for sale. O. Hawley, Baldwin, Wis.

FOR SALE OR TRADE—Good horse, single wagon and two sets harness. J. P. Lynch, Groveland, Fla.

SCENIC HIGHWAY NURSERIES has a large stock of early and late grapefruit and oranges. One, two and three year buds. This nursery has been operated since 1883 by G. H. Gibbons, Waverly, Fla.

CLASSIFIED

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The rate for advertisements of this nature is only five cents per word for each insertion. You may count the number of words you have, multiply it by five, and you will have the cost of the advertisement for one insertion. Multiply this by the total number of insertions desired and you will have the total cost. This rate is so low that we cannot charge classified accounts, and would, therefore, appreciate a remittance with order. No advertisement accepted for less than 50 cents.

REAL ESTATE

FOR SALE—By owner, eighty acres, two-year-old best looking grove at reasonable price. Howey-in-the-Hills. For further information write "A. Z." P. O. Box 1261, Orlando, Florida.

FOR SALE—Pineapple land in winterless Florida. \$15 an acre. Almont Ake, Venus, Fla.

WANT TO SELL HALF INTEREST IN FIFTEEN ACRE SATSUMA BEARING GROVE ON HIGHWAY NEAR PANAMA CITY. ROBT. LAMBERT, OWNER. FOUNTAIN, FLA.

SATSUMA BUDWOOD from Bearing Trees. Hills Fruit Farm, Panama City, Fla.

WANTED—To hear from owner having good farm for sale. Cash price, particulars. John Black, Chippewa Falls, Wisconsin.

REPRESENTATIVE for Counties South of Polk in Sale of Insecticides and Machines. Previous sales experience and knowledge of citrus vegetable industry necessary.

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"Please Say You Saw It in The Citrus Industry"

GUMMOSIS AND PSOROSIS OF CITRUS TREES

(Continued from page 27)

pounds when the temperatures are lower. It is probable that the greater value of the sulphur compounds as fungicides depends in part upon their ability to volatilize slowly over a long period of time. In California it has been found that atomic sulphur will give results equally as good as lime-sulphur and does not have the dangerous feature as the sulphur is in a more stable form and volatilizes much more slowly.

The effect of the treatment in bringing trees back to normal yield is slow. The treatment by scraping tends to stimulate bark shedding and renewal and it takes some time to bring it back where the circulation will not be hindered and for the root system to become re-established, the tree restored to normal production. The process of recovery is almost as slow as the decline.

Convenient tools for use in treating trees for gum diseases consist of a horse hoof knife, boat scraper, wood chisels and wood mallet. Concrete work can be used to advantage at times in tree surgery operations.

Experimental work along these lines is being carried on at the Valley Experiment Station in order to definitely determine the best procedure under local conditions. As already reported it is evident that the thoroughness with which surgical treatment is applied is the most important part of the operation, being much more important than the choice of a fungicide with which to paint the wound.

CAN GET WHITEFLY FUNGUS AT STATE PLANT BOARD

Another supply of Red Ascheronia, principal natural enemy of the Common Citrus and Cloudy Winged Whiteflies during the period of summer rains, is now available at the State Plant Board here, Dr. E. W. Berger, entomologist, stated.

A culture, enough to treat one acre of trees, can be obtained for one dollar, the cost of production. Directions will be sent with the culture, and further information is contained in Experiment Station bulletin 183.

LAKE CITRUS CLEAN

Citrus growers in Lake County are doing a lot of dusting and spraying for rust mites, and indications are that a large percentage of a large crop will be clean, Clifford R. Hiatt, county agent, stated.

Mr. Packing House Manager

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